DRAFT
Environmental Assessment of the Beartooth Pipeline
Billings, Montana to Elk Basin, Wyoming

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S.0 Executive Summary

S.1 Project Description

The proposed action includes the construction and operation of a 12-inch crude oil pipeline between Billings, Montana and Elk Basin, Wyoming. The action represents a joint venture between Amoco Pipeline Company and Conoco Pipe Line Company, and is referred to as the Beartooth Pipeline. The proposed venture will utilize the existing infrastructure of both companies and will include the construction of a pipeline facility capable of delivering a minimum of 50,000 barrels per day (bpd) of design crude. The new section of pipeline will connect Conoco's Glacier pipeline in the vicinity of Billings, Montana to Amoco's Big Horn pipeline near Elk Basin, Wyoming. The addition of new pipeline will allow for conveyance of crude oil between existing delivery systems and refineries in the southern Rockies.

The basis of need for the project involves ensuring the stable and secure availability of crude oil, and providing a source of crude oil that will offset the trend of declining production in the Rocky Mountain region. The Beartooth Pipeline throughput is expected to replace the declining rates of oil production in northern Wyoming (i.e., approximately 1,500 to 2,000 bpd). The cooperative relationship between Amoco Pipeline and Conoco Pipe Line companies results in the maximization of existing systems efficiency while minimizing the extent of new facility construction. Additionally, the project will increase the ability and capacity to transport Canadian crude through the Billings area and on to refiners and merchants south of Billings.

Construction on the Beartooth Pipeline is scheduled to commence July 15, 1996, with all construction activities anticipated to be completed by the end of the year. Construction schedules indicate that primary pipeline construction activities are anticipated to be accomplished within 60 days of commencement.

S.2 Other Similar Actions in the Project Vicinity

Other pipeline facilities are being planned within the Beartooth Pipeline project vicinity. The Express Pipeline, Inc. involves the construction and operation of a 24-inch pipeline that would extend 515 miles, from Wild Horse, Alberta to Casper, Wyoming. The purpose for the Express Pipeline has been identified as providing refiners in the Rocky Mountain and Midwest regions of the United States with crude oil. The project simultaneously addresses the problems associated with declining crude oil production in the Rocky Mountains and Midwest regions and provides markets for Western Canadian producers. Initially, the volumes of crude oil shipped via the Express Pipeline is anticipated to be 172,000 bpd.

The Express Pipeline route is located immediately adjacent to, and utilizes a portion of the right-of-way (ROW) of the Altamont Pipeline. The Altamont project Pipeline involves the construction of a natural gas pipeline. Altamont has established a certified route; however, the pipeline has yet to be constructed based upon uncertain market demand.

Cenex recently constructed a new pipeline from its terminal near Cut Bank to the Cenex refinery in Laurel, Montana. The new facility is a 16-inch, 65,000 bpd pipeline with the capacity to increase to 100,000 bpd.

Collectively, the Beartooth, Express, and Cenex pipelines will increase the capacity to transport Canadian crude to refiners and markets south of Billings.

S.3 Alternates Considered

A number of project alternatives were considered in order to meet the overall objectives of the proposed action and to document compliance with the Montana Environmental Policy Act (MEPA). Alternatives included:

- No-Action;
- Alternate Facility Routes;
- Alternate Methods of Crossing the Yellowstone River; and
- Alternative Methods of Crossing Streams.

In addition to the proposed route, five route alternates were developed and are evaluated in this document. As a consequence of the environmental assessment process, it has been determined that the proposed route and each of the five route alternates are permittable.

S.4 Summary of Environmental Impacts

Impact assessment was accomplished by determining the environmental effects associated with the proposed route by itself and as compared to each of the alternate route segments. A summary of the potential impacts is presented below for each environmental resource.

S.4.1 Socioeconomic Environment

The construction and operation of the Beartooth Pipeline will result in both construction phase and operational phase impacts to the socioeconomic environment. The impacts resulting from the construction of the pipeline include:

- an increased demand for temporary housing;
- temporary increases in populations for Yellowstone, Carbon, and Park Counties;
- short-term localized shortages of temporary housing during the tourist season;

- increased opportunity for employment thereby increasing the potential for increasing earnings-based compensation for local and nonlocal workers;
- greater potential for increased revenue for local services and retail locations; and
- landowner compensation payments for any lost use of land due to the temporary abandonment of an economically productive land use (i.e., row cropping).

Long-term benefits resulting from the operation of the Beartooth Pipeline include:

- the employment addition of two fulltime personnel to assist in pipeline maintenance and operation;
- an increase in county property tax revenues; and
- the addition of a pipeline facility to the existing Amoco and Conoco pipeline systems that will increase utilization of existing assets and provide a delivery system for refiners.

The operation of the Beartooth Pipeline will assist in providing relatively stable supplies of crude oil which will: (1) offset declining regional production levels, and (2) provide some degree of stability in crude oil supply and pricing.

S.4.2 Land Use

Long-term impacts to land use are not expected to be significant as pipelines have been proven to be compatible with most land use types. Short-term impacts will arise from construction. These activities will generally result in the temporary interruption of the land use practices in those areas crossed by the pipeline. Pipeline construction procedures will minimize disturbance and maximize reclamation.

The land use types most affected by pipeline construction are rangeland and agricultural. The proposed route will affect 532.7 acres of rangeland and 132.6 acres of cropland (including 36.9 acres of irrigated cropland). Other potential impacts include disturbance to 7.9 acres of forestland, 8.0 acres of developed land, and 0.27 acres of wetland and riparian areas.

Alternate route segments affected greater areas of dry cropland/pasture [Billings Boulevard Alternate (A_2), Blue Creek Alternate (B_2), and Express Alternate (D_2)]; rangeland [Bluewater Creek Alternate and Polecat Bench Alternate (F_2)]; forestland (B_2); residential (A_2); and riparian/wetland (B_2) relative to the proposed route segments in those areas.

The alternate route segments contained lower impact potential to irrigated land, dry cropland/ pasture (Bluewater Creek Alternate), rangeland (B_2 and D_2), forestland (D_2), and riparian/wetland

(B_2, D_2, and Bluewater Creek Alternates). With the exception of the Billings Boulevard Alternate, no impacts to designated parks or recreation areas are expected to occur. However, the Billings Boulevard Alternate will cross Riverfront Park along the Yellowstone River, which may render it inaccessible to local residents during the construction phase.

S.4.3 Transportation

No significant adverse impacts to the three-county transportation infrastructure are anticipated to result from the construction or operation of the Beartooth Pipeline. The proposed route will involve the following crossings:

- 2 primary roads (common to any combination of segments);
- 20 secondary roads;
- 7 pipelines; and
- 3 railroads.

Major road crossings (Interstate 90, and State Routes 310 and 295) will be accomplished by drilling, thus minimizing interference of traffic flow during construction.

By comparison, the alternate route segments entail fewer road crossings with the Blue Creek Alternate; the same number of crossings for the Bluewater Creek and Polecat Bench Alternates; and a greater number of crossings for the Billings Boulevard and Express Alternates.

S.4.4 Air Quality

Potential impacts to air quality are limited to the construction phase of the Beartooth Pipeline, and are expected to be similar for all alternate route segments. Pipeline construction activities translate to increases in vehicles, heavy machinery, and worker and supplier traffic. The short-term consequences of increased traffic volumes will increase total suspended particulates (dust) and hydrocarbon combustion by-products. These impacts are not considered significant, nor are they expected to adversely impact regional air quality.

S.4.5 Noise

Increases in local noise levels will be limited to the construction phase of the Beartooth Pipeline project. The changes in local noise levels will be directly related to the increase in construction related traffic, and heavy machinery and equipment required for pipeline construction. The perception of changes to the noise environment are closely related to the number and types of noise receptors within a given area. Given the predominantly rural nature of the project area, significant adverse impacts associated with increased noise levels are not anticipated. However because of a greater density of residential development along its length, the Billings Boulevard

Alternate is expected to have a greater potential for noise impacts due to its greater proximity to sensitive receptors.

S.4.6 Visual Resource

Significant impacts to regional and local aesthetics are not expected to result from the construction and operation of the pipeline. Impacts to viewsheds will occur during the construction phase of the pipeline, resulting from the clearing of vegetation, grading, excavation, and the presence of construction vehicles and equipment. Those sections of pipeline that occur within existing developed corridors may have reduced impacts on aesthetics. Overall impacts to the aesthetic values of the project area are considered short-term in duration. Ultimately, the resolution of long-term impacts to visual and landscape aesthetics will be determined by the success of reclamation efforts.

S.4.7 Natural Resources

Impacts to soils and surficial geology will occur as a result of pipeline construction activities. Construction activities affecting project area soils will result in soil compaction, soil excavation/ horizon mixing, and the clearing of vegetation. These activities may increase the potential for local soil erosion. Topsoil stockpiling will occur, and soil salvage areas will be designated to enhance reclamation efforts. Other mitigative measures to minimize long-term effects on soils will include final regrading, mulching, fertilizing, and revegetation. There will be some localized alterations of surficial geology based upon the areas that the pipeline traverses. The excavation of rock is not expected to result in significant impacts to the geological resource.

The selected route for the Beartooth Pipeline should be surveyed for the presence of landslide and potentially geologically unstable areas. Where the pipeline route crosses such areas, the pipeline should be rerouted in order to avoid any future compromise of facility integrity resulting from landslides.

The proposed route and the alternate route segments will result in short-term and long-term impacts to surface water resources. The short-term impacts are associated with pipeline construction activities. With the exception of the Yellowstone River crossing, all stream crossings will be trenched. The nature of this activity creates habitat alteration, increased siltation and sedimentation rates, and increased potential for pollutant loading.

The proposed route will cross a total of 62 streams (8 perennial crossings and 54 intermittent crossings). Alternate route segments with fewer total stream crossings than the proposed route include Billings Boulevard (6 versus 10 crossings), Blue Creek (3 versus 9 crossings), and

Bluewater Creek (5 versus 8). In contrast, the Express and Polecat Bench Alternates cross a greater number of streams as compared to the proposed route (27 versus 15 and 18 versus 17, respectively). The potential impacts to water quality and aquatic ecology increases as the number of crossings increase. As outlined in Section 2.5.3.1, construction procedures will be established to avoid and minimize adverse impacts to surface waters and aquatic habitats.

Significant impacts to groundwater resources are not anticipated. The long-term potential for contamination is related to the increased probability of an accidental oil release to the environment. Strict maintenance and operational procedures will be in place to help prevent such an occurrence.

Impacts to floodplains will occur during the construction phase (i.e., excavation) and are considered short-term in duration. In those areas where excavation is required for pipeline installation, the pipe will be buried at depths of two times the scour depth. Directional drilling of the Yellowstone River is the selected method of crossing and will reduce the short-term impacts to associated floodplains. According to FIRM mapping, the proposed route will cross 5,250 feet of designated floodplain. Comparatively, the alternate route segments traverse fewer designated floodplains, with the exception of A_2. The Billings Boulevard Alternate (A_2) would span 4,200 feet of floodplain.

Impacts to terrestrial ecology are directly related to habitat modification, which will result in alterations in vegetative cover, avoidance of construction areas by wildlife, and minor habitat fragmentation. Those habitats most affect by the proposed route and the alternate route segments are rangeland and agricultural lands. These impacts are not considered significant. The most significant impact is the increased potential for noxious weed invasion, as weedy species typically invade disturbed ground and out compete native species.

There are documented occurrences of sensitive, and threatened and endangered species within the vicinity of the proposed route and the alternate route segments. The evaluation of impacts to sensitive resources such as threatened, endangered, or species of special concern was entirely based upon the use of existing data from previous investigations. Consequently, the analysis may represent incomplete information. Any impacts to listed and sensitive species will be avoided and minimized during the construction phase of the Beartooth Pipeline project. In those areas where species or habitats of sensitive or listed species occur, construction procedures will minimize impacts by conducting surveys prior to construction; narrowing the construction ROW, where necessary; and coordinating with the appropriate agencies. Mitigation measures will be implemented for any impacts to listed and sensitive species.

S.8 Cultural Resources

A number of cultural resources have been identified within the areas of the proposed route and the alternate route segments. These resources are characterized as either National Register of Historic Places (NRHP) eligible, or of unknown eligibility. The information gathered for this document is based upon existing data from previous investigations, and therefore may represent incomplete information. After the selection of the final route, a survey will be conducted in state or federally owned lands within the construction ROW to identify any undiscovered sites that may be NRHP eligible. Mitigation of sites potentially eligible for NRHP listing may involve shifting the proposed ROW to avoid the sites, or engaging in data recovery by excavating the sites.

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List of Acronyms and Abbreviations

ac-ft	acre-feet
ac-ft/yr	acre-feet per year
ACEC	Area of Critical Environmental Concern
API	American Petroleum Institute
ARPA	Archaeological Resources Protection Act of 1979
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
bpd	barrels per day
CFR	Code of Federal Regulations
CFYR	Clarks Fork of the Yellowstone River
COE	U.S. Army Corps of Engineers
dB	decibels
DNRC	Department of Natural Resources and Conservation
DOT	Department of Transportation
E	endangered
EA	Environmental Assessment
EAI	Energy Analysts International, Inc.
EC	electrical conductivity
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FLPMA	Federal Land and Policy Management Act of 1976
GLO	General Land Office
IPL	Interprovincial Pipe Line
LUST	leaking underground storage tank
MBMG	Montana Bureau of Mines and Geology
MDEQ	Montana Department of Environmental Quality
MDFWP	Montana Department of Fish Wildlife & Parks
MEPA	Montana Environmental Protection Agency
MNHP	Montana Natural Heritage Program
MPDES	Montana Pollution Discharge Elimination System Permit
MW	Midwest

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List of Acronyms and Abbreviations (cont.)

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
ROW	right-of-way
SAR	sodium absorption ratio
SHPO	State Historic Preservation Office
sq. mi.	square mile
SWPPP	Stormwater Pollution Prevention Plan
T	threatened
TDS	total dissolved solids
TSP	total suspended solids
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WSGS	Wyoming State Geological Survey

1.0 Purpose and Need

The Amoco Pipeline Company and the Conoco Pipe Line Company are proposing, as undivided joint interest pipeline system owners, the Beartooth Pipeline which would result in the cooperative transport of crude oil. The transport system will involve the utilization of existing infrastructure of both companies and require the construction and installation of a new pipeline facility between Conoco's Glacier Pipeline in the vicinity of Billings, Montana and Amoco's Big Horn Pipeline near Elk Basin, Wyoming. The addition of the new pipeline will convey crude oil between existing delivery systems and refineries in the southern Rockies. This new pipeline facility is referred to as the Beartooth Pipeline and represents the proposed action under review in this Environmental Assessment (EA) document.

The primary basis of the project purpose and need includes the following:

- Ensure the availability of a relatively stable and secure crude supply;
- Provide a source of oil that will offset declining crude production in the Rocky Mountain region; and
- Minimize the need for new facility construction by enhancing the efficiency of existing systems by optimizing the use of Amoco Pipeline Company and Conoco Pipe Line Company assets. The connection of Conoco's Glacier system to Amoco's Big Horn system is expected to increase the utilization of existing assets to approximately 100 percent.

1.1 Existing Amoco and Conoco Pipe Line Infrastructure

Conoco's Glacier Pipeline system is a 115,000 barrel per day (bpd) 300-mile ANSI 600 pipeline system consisting of 8-inch to 10-inch and 12-inch pipelines roughly in parallel. The existing system accepts deliveries from Rangeland Pipeline just south of the Canadian border; from the Bow River Pipeline system at Cutbank, Montana; and terminates at Conoco's refinery in Billings. Heavy crudes are pumped down the 12-inch pipeline while lighter grades are pumped on the 8-inch line. The 8-inch pipeline accepts additional receipts from a Montana gathering system at Roundup (approximately 50 miles northeast of Billings) and becomes a 10-inch pipeline from there into the Billings refinery.

Amoco's Big Horn Pipeline is a 230-mile ANSI 600 12-inch pipeline originating at Amoco's Elk Basin Station in Wyoming and terminating at Casper, Wyoming. The system receives Y-crude injections at various points along the line. At Casper, sweet crude batches are placed in tankage at Casper to be pumped west to Salt Lake City. Big Horn Pipeline connects to Amoco's 115-mile

ANSI 600 Casper to Ft. Laramie pipeline system which pumps the crude east to Ft. Laramie, Wyoming. The line makes a delivery to Conoco at Guernsey Junction, approximately 104 miles east of Casper.

1.2 Proposed Action

The Beartooth Pipeline project will consist of the design and installation of a 12-inch crude oil pipeline system capable of pumping a minimum of 50,000 bpd of design crude. The pipeline will originate at a new pump station at Conoco's refinery in Billings, Montana and terminate at Amoco's Elk Basin Station in Wyoming. To allow operational flexibility, the station will be designed to allow tightlining from either of Conoco's 10-inch or 12-inch pipelines on the Glacier Pipeline system or originate from tankage at the refinery.

Two tanks will be dedicated to the Beartooth Pipeline system at both the Billings refinery and Elk Basin Station. The system will also have the flexibility to receive oil from other tanks at Billings through connections at the manifold. Custody transfer from Conoco to Amoco will take place at the Billings pump station.

Initial volumes through the Beartooth Pipeline system will supplement volumes from production in the lower Rockies. Conoco will ship primarily sour crudes to its Denver refinery, and Amoco will ship primarily sweet crudes to its Salt Lake City refinery. Projections are for production in the southern Rockies to continue to decline at a rate of approximately 15,000 to 20,000 bpd annually, and the Beartooth Pipeline throughput is expected to increase with the declining production.

Construction is anticipated to begin on July 15, 1996. Estimated completion is in December of 1996. The facility is expected to begin operations in 1997. In summary, the proposed action will provide crude oil to refineries in the southern Rockies at volumes similar to those that would otherwise be lost due to declining rates of crude production in the Rocky Mountain region. The cooperative effort between Amoco Pipeline Company and Conoco Pipe Line Company optimizes the use of existing systems, minimizes the need and expense for new construction, and creates a new link between out-of-region oil fields and refineries in the southern Rockies. The projected cost for the construction of Beartooth Pipeline is $18,000,000.

1.3 Permitting and Regulatory Compliance

Amoco and Conoco's proposed Beartooth Pipeline project would require the decisions of various county, state, and federal agencies to:

1. approve the applications and issue permits as proposed for the Beartooth Pipeline project;
2. approve the applications with modifications and issue the approvals or permits with conditions as necessary; or
3. deny the various applications.

Prior to the commencement of construction activities affecting areas requiring authorization in Montana and Wyoming, Amoco and Conoco would seek approval from the agencies listed in Table 1-1. Easements across private lands would also be acquired, first through negotiation with landowners or, if negotiations fail, through condemnation.

1.3.1 U.S. Army Corps of Engineers

The permitting and regulatory authority for the discharge of dredged or fill materials related to construction of pipelines in wetlands and other "Waters of the United States" is administered by the Army Corps of Engineers (COE) pursuant to the federal Clean Water Act [40 Code of Federal Regulations (CFR) 323.1 and 330] and the Environmental Protection Agency (EPA) pursuant to Section 404(b)(1) guidelines (40 CFR 230). Temporary disturbance associated with pipeline construction across COE jurisdictional areas (wetland and non-wetland Waters of the United States) can be authorized under Nationwide or individual Section 404 permits. Water quality certification (Section 401) is required from Montana as part of the permit issued by the COE under the 404 program.

1.3.2 U.S. Bureau of Land Management

Depending on the alternative route selected, small parcels of Bureau of Land Management (BLM) land along the route would be crossed. The BLM is a cooperating agency in this EA and would use this document to comply with the National Environmental Policy Act (NEPA) review requirements prior to the approval of the crossing of federal lands by the project.

1.3.3 U.S. Fish Wildlife Service

Under the Federal Endangered Species Act of 1973, as amended, special protection is provided to any species and its habitat that is listed as endangered or threatened. Protection is also afforded to migratory birds and raptors through federal legislation.

1.3.4 Montana

1.3.4.1 Department of Natural Resources and Conservation (DNRC)

Trust Land Management. The Montana Board of Land Commissioners may grant an easement for right-of-way (ROW) across any portion of state lands, including the beds of navigable waterways. Permits, licenses or easements for construction activities on state-owned lands are authorized under Title 77, MCA. The ROW easement grants a permanent ROW for the life of the project. A Land Use License must be authorized for temporary land use disturbance during construction. Construction under or across state navigable rivers requires an easement for the state-owned lands between and below the high water marks as determined by DNRC. Specifically, the Yellowstone River is considered a navigable stream.

Floodplain Management. Proposed pipeline construction activities within designated 100-year floodplain areas require a Floodplain Development permit, pursuant to the Montana Floodplain and Floodway Management Act (75-5-401 through 406m, MCA) administered through DNRC. The proposed project would involve construction within the designated 100-year floodplain of the Yellowstone River and other streams as shown on Figure 3-4. Local approvals would be required from disaster and emergency services personnel in Yellowstone and Carbon Counties for pipeline burial depth across designated floodplains.

Beneficial Water Use. Amoco and Conoco would be required to comply with the Montana Water Use Act of 1973. A beneficial use permit allowing Conoco or Amoco to withdraw from an unappropriated source would be required for the temporary acquisition of water for hydrostatic testing of the pipeline or for water used during construction. Water also could be acquired through purchase of water from an existing water rights holder although the use may require a Change in Use Authorization from DNRC.

1.3.4.2 Montana Department of Transportation and County Road Departments

State-owned highways and Interstate 90 would be crossed by the project, requiring approval by the Department of Transportation (DOT) of roadway crossing methods and in obtaining of utility occupancy permits. A number of county-owned roads would be crossed, necessitating approval from local county road departments.

1.3.4.3 Yellowstone and Carbon Counties Conservation Districts

Under Montana's Natural Streambed and Land Preservation Act, local conservation districts are authorized to approve activities such as crossing of perennial streams by pipelines where disturbance to the bed, banks, islands or channels of these streams or rivers will occur. This approval includes consultation with the Department of Fish, Wildlife and Parks. Based on visits conducted to the site, the local district may waive or require additional certification to address water quality concerns through a process known as the 3A Authorization, or short-term water quality exemption issued under the Montana Water Quality Act as noted below.

1.3.4.4 Montana Department of Environmental Quality (MDEQ)

3A Authorization. The Montana Water Quality Act (75-5-101, MCA) allows the DEQ to authorize short-term exemptions from certain surface water quality standards for short-term construction activities which may have short-term impacts on water quality. DEQ may waive the requirement for a 3A Authorization following a recommendation by local conservation districts under the 310 permit process.

Stormwater General Permit. Under the Water Quality Act (75-5-401, MCA), DEQ must approve activities having potential to result in discharge of stormwater to waters of the state. Approval of a Montana Pollutant Discharge Elimination System (MPDES) Stormwater General Permit for Construction Activities, including a Stormwater Pollution Prevention Plan (SWPPP), will be required for the Beartooth Pipeline project. An MPDES application is being developed by Amoco/Conoco which will address the use of protective stormwater runoff and erosion control prevention measures during pipeline construction and operation.

401 Certification. Under the federal Clean Water Act, DEQ retains authority for 401 certification for actions taken by the COE under the 404 permit process. The certification process provides a review of potential adverse water quality impacts associated with discharge of dredged or fill material in wetlands and other waters of the United States.

1.3.4.5 Yellowstone and Carbon Counties Weed Boards

Under the Montana Noxious Weed Control Act, County Weed Districts provide weed management through planning and implementation of a coordinated program for the containment, suppression and possible eradication of noxious weeds. In compliance with the provisions of each county Noxious Weed Control Plan, a noxious weed management plan must be prepared and approved for the Beartooth Pipeline project by each local Weed Control Board.

1.3.5 Wyoming

As noted in Table 1-1, the Beartooth Pipeline project would require certain approvals within the state of Wyoming from federal state and local agencies.

2.0 Project Alternates

A number of types of project alternatives were considered in order to meet the objectives of the project. Specifically, alternatives considered included the following:

- No Action;
- Alternate Routes;
- Alternate Methods of Crossing the Yellowstone River; and
- Alternative Methods of Crossing Secondary Streams.

This section provides a description of the process utilized in the development and evaluation of study alternatives, the issues considered in the process, evaluation criteria and methodology, and a description of the alternative routes considered.

2.1 Development of Preliminary Project Constraints

A considerable amount of effort was expended in the early phases of the location study process to identify and characterize the various constraints of the project area. Constraints considered during this process entailed those that represented environmental concerns as well as those that had implications as to engineering feasibility. Examples of environmental constraints considered during this stage of the project included the following:

- Wetlands and riparian zones;
- Floodplains;
- Surface water resources (streams, water bodies);
- Threatened and endangered species;
- Rare or unique ecological communities;
- Potential or known hazardous waste sites;
- Wildlife resources (big game winter range, grouse leks, etc.);
- Wild and scenic rivers;
- Archaeological or historic sites;
- Land use (cropland, rangeland, forest, etc.);
- Churches, schools, and cemeteries; and
- Residential and commercial areas.

Similarly, constraints were also identified that had implications as to engineering feasibility or the efficiency of the transportation system. Examples of such considerations included:

- Terrain (i.e., slope and elevation);
- Geologic formations;
- Fault zones and potential landslide areas;

- Floodplains;
- Soil type;
- Transportation infrastructure; and
- Existing pipeline and transmission line networks.

Constraint information was developed by acquiring and consolidating information from a variety of sources. Specific file information was requested and received from various state agencies including the Montana Natural Resource Information Service, Montana DOT, Montana Historical Society, Montana Department of Fish Wildlife & Parks (MDFWP), Wyoming Game and Fish Department (WGFD), and the Geological Survey of Wyoming. Federal agencies contacted included Natural Resource Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), Federal Emergency Management Agency (FEMA), BLM, and U.S. Geological Survey (USGS). Other sources utilized to develop project area constraint data included Yellowstone and Carbon Counties in Montana, Park County in Wyoming, the City of Billings, and field reconnaissance.

2.2 Project Scoping

Project scoping was initiated early in the process by conducting two informational meetings in the project area in the Fall of 1995. Meetings were held in Billings and Bridger, Montana on November 7 and 8. In addition, other comments were provided as a result of early coordination and correspondence with representative agencies. Concerns and comments expressed as a result of these scoping efforts included the following issues:

- **Potential Impact to Bluewater Fish Hatchery**. Concern was expressed that the present location of the proposed route posed a threat to the fish hatchery in the event of an accidental release. In addition, concern was expressed regarding the potential impacts to the natural, self-sustaining population of brown trout in Bluewater Creek.
- **Wetlands and Sensitive Species**. Some concern was expressed relative to the potential effect on wetlands of the project area and the rare plant species associated with wetland habitats, notably in the vicinity of the Bluewater Fish Hatchery.
- **Stream Crossings**. Issues included the methods that may be used in crossing the Yellowstone River and other streams of the project area, the depth of the pipeline below the stream bed, and potential permitting needs.
- **Hydrostatic Testing**. The sources of water that may be used for hydrostatic testing of the proposed pipeline were of some concern.
- **Potential Surface Water and Groundwater Contamination**. Some concerns and questions were raised regarding the potential for an accidental release and the subsequent contamination of surface waters such as Bluewater Creek, or springs and

wells. Local aquifers of concern include the Chug Water, Ten Sleep, and Madison. In addition, some concern was expressed regarding the potential for impacts to downstream water users.

- **Reclamation of the Construction Site.** Issues discussed included the strategies that will be used for revegetation of disturbed areas, the potential responsibility for introducing weeds as a result of the construction activities, and the source of plant material for use in the revegetation of disturbed areas.
- **Project Schedule.** Issues included both the timing of the construction phase and its duration.
- **Employment.** Several questions were raised relative to the likelihood of using Montana residents to construct the proposed pipeline, the use of union versus non-union workers, and the potential for a plant shut-down at the Billings refinery as a result of the transport of crude oil from Canada beyond Billings.
- **Landowners.** The concerns expressed by landowners included the potential for downstream impacts on irrigation, the notification of landowners of the proposed action (i.e. final pipe routing location, construction schedule), and the potential for reduced land values as a result of the discovery of a threatened or endangered species on a landowner's property.

An additional scoping meeting was conducted with interested agency personnel on January 31, 1996 to present the corridors that were selected for final route development. Particular issues expressed at that meeting included the following:

- **Stream and Wetland Permits.** The potential need for Section 401 (Water Quality Certification) and 404 permits for proposed stream and wetland crossings was discussed for various potential streams of the project area.
- **Floodplains.** The potential need for Floodplain Authorization for proposed floodplain crossings was discussed.
- **Urban Area Restrictions.** Urban areas generally are less desirable locations for pipelines due to the potential for third party damage to the pipeline.
- **Construction Schedule.** Timing of construction activities due to the potential for interference with raptor nesting, fish spawning cycles, and stream flow regimes.

2.3 Routing Options Considered and Dismissed

A broad range of routing options between Billings and Elk Basin were examined as described in Appendix C. These analyses were initiated at a broad corridor level and were subsequently refined to precise routing alternatives. For the reasons discussed in Appendix C, many of these options were eliminated from further consideration as they did not offer advantages over those segments carried forward for detailed consideration. Segments carried forward for detailed consideration are identified as route alternatives and are described in Section 2.5.

2.4 Evaluation of Alternate Route Segments

The evaluation of the final route alternates involved a greater level of detail and consisted of the development of quantitative and qualitative information for each segment for use as a basis for the evaluation of complete study alternates.

The specific evaluation criteria used were selected based upon research that was conducted in the corridor, input from the public and agencies as part of the scoping process, and the requirements of Montana Environmental Protection Agency (MEPA) (i.e., a multi-disciplinary consideration of impacts to the human and natural environments).

Quantitative data were also developed for each of the alternate route segments and were used to reflect the potential magnitude of impact of each realignment as compared to the proposed route. These criteria were selected to measure the overall suitability of each alternate and their resulting impacts on the human and natural environment.

2.5 Description of the Final Study Alternates

2.5.1 Description of the Applicant's Proposed Route

As presented in Figures 2-1 and 2-2, the proposed route extends approximately 78 miles from the Conoco refinery in Billings and terminates at Amoco's existing Elk Basin Station in Wyoming. Enlargement of the route alternates are provided in Appendix A. For the purposes of comparison, the route was subdivided into lettered segments beginning with A_1 in the north and ending with F_1 in the south. In all cases where there is a segment that has a proposed alternative, the Beartooth Pipeline has been labeled with a subscript of "1".

The proposed Beartooth Pipeline route has its origin at the existing Conoco refinery in Billings. The route has been realigned out of the Bitter Creek Valley and no longer exactly parallels the Seminoe Pipeline. The new route goes more directly south through dry land areas and is approximately 1 mile west of the Seminoe Pipeline. It then turns southwesterly and westerly crossing Blue Creek and Keller Jellison Road before turning to the south along Spring Creek Road. It then continues southerly, crossing Five Mile Creek and passing east of the Bluewater Fish Hatchery. The proposed route is then directed southeasterly and then southerly into the Bowler Flats area, crossing Sage Creek. It then turns to the southwest crossing the Burlington

Northern Railroad and Route 310, and terminating at Amoco's existing Elk Basin Station in Wyoming.

Although several subtle revisions to the original route proposed by Amoco/Conoco for the Beartooth Pipeline were considered, one such revision was adopted as a formal modification of the original route. The location of this modification is presented in Figure 2-3, and is located 1.5 miles north of the proposed crossing of Five Mile Creek. Based upon a preliminary comparative evaluation of this route and the original route, the original alignment was modified to follow the revised route due to an improved degree of access during construction.

2.5.2 Alternates to the Proposed Route

Billings Boulevard Alternate--Segment A_2

This alternate, located in the northern portion of the route, differs from the proposed route in that it extends southwesterly from the refinery following an existing pipeline. Prior to crossing the Yellowstone River, however, the proposed pipeline would cross Riverfront Park along the Yellowstone by the use of trenching for a distance of approximately 4,000 feet. The Yellowstone River, however, will be crossed by directional drilling. The Riverfront Park is designated as a nature preserve and is a major recreational area in the vicinity of Billings. Once the Yellowstone River is crossed, the pipeline extends southerly following an existing pipeline and then turns southwesterly joining the southern terminus of Segment A_1.

Blue Creek Alternate--Segment B_2

This alternate was developed as a more direct alternative to the route represented by Segment B_1. It generally extends southwesterly following the northwest ridge along Blue Creek to the radio towers along Price Hill Road. It then turns westerly to meet the southern terminus of Segment B_1.

Bluewater Creek Alternate--Segment 4

The Bluewater Creek alternate was primarily developed in response to concerns expressed during the scoping process with regards to potential impacts to the Bluewater Fish Hatchery, and rare plant species, surface water and groundwater, in the vicinity of the fish hatchery (see Section 2.2). From a point northeast of the Bluewater Fish Hatchery, this alternate extends south crossing relatively flat terrain until crossing a narrow but relatively deep (approximately 70 feet) canyon associated with a tributary of Bluewater Creek. After crossing the canyon, the route extends southeasterly on nearly level to undulating terrain before descending into the Bluewater Creek valley and joining the proposed route.

Express Alternate--Segment D_2

Because of concerns expressed during the scoping process about potential impacts to the Bluewater Fish Hatchery, a realignment (Segment D_2) was developed that generally follows the Express Pipeline route east of the hatchery and the proposed Beartooth Pipeline route (Segment D_1). The route parallels the Express Pipeline route to a point north of Bowler, where it then follows the southern extension of Bureau of Indian Affairs (BIA) Route 5 east of Bowler, joining the proposed route at the northern terminus of Segment E.

Polecat Bench Alternate--Segment F_2

The proposed southern alignment along Segment F_1 generally traverses somewhat uneven terrain on new alignment for much of its length. Segment F_2 was developed to provide an alternative to reach the southern terminus while maintaining a greater length along a pre-existing pipeline corridor. From the south terminus of Segment E, this realignment extends generally south following gentle terrain across the Polecat Bench. At a point due east of the proposed southern terminus of the project, however, the route turns west following the north section line to the terminus of the pipeline in Elk Basin.

2.5.3 Pipeline Construction

The proposed construction schedule for the Beartooth Pipeline indicates that construction will begin on July 15, 1996. The construction of the pipeline will be accomplished utilizing one spread team. The spread team will be responsible for all aspects of construction along the segment including clearing and grading, ditching, hauling and stringing, pipe bending, welding, joint coating, etc. Figure 2-4 provides a representation of a typical construction spread. Construction is expected to be completed by the end of the year. In the areas where the pipeline will traverse predominantly level to moderately sloping ground, construction is anticipated to progress between 1 and 3 miles per day (average). In areas characterized by rugged terrain, construction progress is estimated to be between 0.5 and 1 mile per day. The construction ROW has been calculated to be 80 feet along the length of the pipeline (Figure 2-5). The exception will be in the vicinity of the Yellowstone River crossing where the construction ROW required will be approximately 100 feet in width. The increased width will satisfy the need for additional equipment space.

Prior notification of construction will be communicated to landowners and tenants within the construction ROW, and will be completed with the cooperation of property owners and tenants. Construction activities will generally occur between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday, however, there is the potential that crews may work 7 days a week in order to maintain project schedule. The general timing of the commencement of construction has been established to avoid impacts to wildlife species documented as occurring within the project area during breeding and nesting seasons. If construction does begin prior to the end of all breeding and nesting seasons of resident wildlife, construction activities will be limited to avoid and minimize disturbances to these species. Proposed mitigation measures to avoid and minimize disturbance and the potential for adverse impacts to wildlife and sensitive plants species are presented in Section 4.11.

Equipment and Material

The construction equipment required for the installation of the pipeline is expected to be the same as or similar to a typical rural spread (Table 2-1). Table 2-1 provides representative types of construction equipment that are to be used for this project.

2.5.3.1 General Methodology

While there are differences in route location for each of the final study alternates, the methods and timing of construction will be similar. The following represents a description of the general construction measures that will constitute the proposed action.

The process of constructing the pipeline will include five primary phases: preconstruction activities, preparation of the ROW for construction, installation of the pipeline, restoration of the ROW, and testing of the pipeline.

Preconstruction Activities

Piping will be coated by a coating vendor before being delivered for use at construction sites. After treatment, piping will be stored at a contractor's yard or project staging area until it is loaded onto trucks for stringing along the ROW. Valves and fittings will be stored at the Billings pump station.

In most cases, pipe and equipment will be delivered directly to the ROW by truck. Contractor equipment will be left parked in the ROW overnight. No additional space will be required for storage and staging areas. The area for storage and staging will be satisfied by the 80-foot construction ROW and existing staging and storage areas. There will be locations along the pipeline where turnaround space will be necessary within the construction ROW so that trucks carrying pipe and construction materials can unload. Such areas will be located to facilitate efficient unloading in areas where roadways are not present.

During all phases of construction, the refueling and lubrication of construction equipment will be at a designated distance of greater than 100 feet away from stream and wetland areas. This will reduce the risk of construction-related spills. A maximum of two barrels of fuel will be stored at construction sites within 0.5 mile of sensitive streams and wetlands. Any heavy equipment used for the project will be high-pressure power-washed prior to the start of construction and inspected daily for leaks. No leaking equipment will be used in or near surface water.

The primary field operations prior to construction will include ROW acquisition and surveying. ROW agreements required for construction will specify (1) the areas to be surveyed; (2) the location of the pipeline; (3) the vegetation to be cleared; (4) the reclamation plans to restore the surface to preconstruction condition and allow for private landowners and/or federal or state management agencies to continue land use practices; and (5) the access to the pipeline for future operations and maintenance. All necessary permits will be obtained as required to authorize access to, and construction and operation of, the pipeline (see Section 1.3). An SWPPP will be developed and implemented for this project.

The proposed pipeline route and alternate segments have been evaluated in order to avoid areas characterized by highly erodible conditions. The pipeline will be designed to minimize erosion of soils during construction. Areas of steep slopes will be investigated to ensure that appropriate stabilization measures are included in the design. These measures could include diversion berms and drainage control.

The routing of the proposed alternate and the alternate segment involved the identification, and avoidance of, areas that have been documented as containing threatened, endangered, and sensitive species. If listed or sensitive species are found to occur within those areas and cannot be avoided, mitigation measures will be developed with the coordination of the pertinent state and/or federal agency(ies) (see Section 4.11).

Preparation of the ROW

In most locations, preparation of the 80-foot wide ROW will involve the removal of obstacles (e.g., trees, large rocks, brush and logs) from the permanent easement and temporary construction work space, and partially leveling and smoothing abrupt changes in contours along the ROW. The permanent easement (50 feet wide) and temporary work space will provide sufficient space for all construction activities and for the temporary storage of spoil (material excavated from the trench) and salvaged topsoil (see Figure 2-5). These latter activities will be performed in accordance with Amoco Pipeline Company construction specifications.

Merchantable timber within the proposed ROW will be salvaged as directed by the property owner. All remaining slash, stumps and other debris cleared from the ROW will be disposed of in conformance with special provisions applying to the tract of land involved and all applicable laws, rules, and regulations.

Topsoil will then be stripped within the ditch line and areas will be graded, as necessary, to create a flat surface for the safe operation of heavy equipment and vehicles. Minimal grading will be required where the terrain is flat or where the ROW parallels the fall line of the slope. On excessively steep slopes that would otherwise require an extensive cut, grading will be reduced by using detour access roads for rubber-tired traffic around the slope. Where steep sidehills are unavoidable, two-toning will limit the need for deep cuts and will be implemented to reduce the amount of grading necessary.

Topsoil will be handled separately from subsoils or spoil, unless directed differently by the landowner. Topsoil will be stripped from the trench and spoil areas only. Conventional bulldozers and graders will be used to remove topsoil from the trench and areas where the subsequently removed spoil would be piled. Topsoil will be stored separately from spoil (see Figure 2-5). Where grade cuts result in additional spoil, the spoil may be stored on either side of the construction area. No drains and ditches would be blocked by topsoil or subsoil storage piles.

Installation of the Pipe

Over most of the ROW, the pipe will be installed using standard trenching and backfilling techniques. Trench or ditch depths will be dependent upon the surficial conditions encountered. The depth of the ditch may vary from the typical 48-inch depth. A minimum of 36 inches of cover will be maintained, except where rock is encountered. In areas characterized by solid rock, a minimum of 18 inches of cover will be maintained. Topsoil will be segregated by double-ditching on all cultivated and developed land. Lands will be restored to preexisting conditions. When crossing canals, borrow ditches, or irrigation ditches that are dredged to maintain depth, the concrete-coated pipe will be installed to a depth that will permit safe dredging operations with a minimum of 5 feet of cover. At road crossings, the depth of the ditch will conform to appropriate regulations. At these crossings, standard specifications require a minimum of 4 feet of cover between the top of pipe and the lowest point of the bar ditch, or a minimum of 5 feet of cover between pipe and the top of the road surface, whichever dimension provides the greatest depth. Access roads across the ditch will be provided and spaced at convenient intervals to allow landowners, livestock, and wildlife to cross the construction area. Generally, there will be no more than 2 miles of open ditch during daytime hours and no more than 0.5 miles at night per construction spread at any given time.

The method used to excavate the trench for the pipe will vary with local conditions. In areas with deep soils, the trench will be excavated with a ditching machine. Hydraulic backhoes will be used where ground conditions are not suitable for ditching machines and wherever a deeper or wider than normal ditch is required (i.e., at tie-ins). In areas of loose rock, bulldozers equipped with a single shank ripper will precede the backhoes. Solid rock will be drilled and blasted in a controlled manner. It is not anticipated that blasting will be necessary, however, if blasting were to occur, it will be accomplished as per all applicable state and federal permits. Following any blasting, the trench will be excavated using backhoes.

Construction sites are to be maintained in sanitary conditions at all times. All waste materials and garbage will be disposed of promptly at an appropriate disposal site.

In areas where extensive rock is encountered, the time required for trench construction will increase. To maintain efficiency, longer lengths of the trench will be opened before the pipe is strung, welded, and lowered. As a result, in the few areas where extensive consolidated rock will be encountered, the trench may be open for longer periods and the completion of construction activities at a given point will be extended accordingly. During this period, special precautions will be taken to ensure public safety and erosion control.

Underground utility lines crossed by the pipeline will be identified and flagged during the preconstruction phase. Trenching operations near all such utility lines will proceed only after each line's exact location has been determined by hand excavation.

Erosion control measures required under the stormwater permit will be employed to minimize and control erosion during trenching operations and other construction activities. In any areas where a high groundwater table is encountered and de-watering is necessary, water would be discharged in a manner that would minimize sedimentation and prevent offsite erosion and scouring of adjacent waterways. Generally, discharge to the ground is permitted if discharges do not reach Montana waters. In environmentally sensitive areas (e.g., adjacent to streams) where vegetation may be inadequate to function as a filter, bale filters or other appropriate measures would be used to limit siltation. Measures would also be taken to minimize free-flow of water into the trench and from the trench into any body of water. Water crossings will be undertaken as described subsequently in this section. The construction of crossings will avoid excessive channel disturbance during isolated high-runoff events. All stream channels and washes will be restored to preconstruction conditions as soon as possible after construction.

The stringing operation will involve trucking pipe from designated storage areas or directly from rail cars to the work site and placing them into position along the ROW in preparation for bending, positioning, and welding. The location of pipe storage areas and rail sidings will be determined during the detailed design phase of the project. Individual joints of pipe will be strung along the ROW, parallel to the centerline of the trench and arranged so they are easily accessible to construction personnel. At stream and road crossings, sufficient pipe will be stockpiled at staging areas near each crossing. Stringing activities will be coordinated with the advance of the trenching and pipe laying crews to minimize the length of time that a specific tract of land is occupied by the various construction crews. Temporary gaps will be maintained coincident with the access ways across the trench to allow landowners, livestock, and wildlife to cross the ROW.

In general, pipe will be delivered to the construction area in straight joints and bent on-site to conform to minor changes in the pipeline's alignment and natural ground contours. Bends made in the field will be made by track-mounted, hydraulic pipe-bending machines. Although most bends will be accomplished on-site, prefabricated bends may be required in some areas.

After the pipe has been bent, it will be positioned and welded in conformance with Federal DOT Regulations 49 CFR Part 195, Subpart D, "Construction" and the latest edition of American Petroleum Institute (API) Standard 1104. The pipe joints will be welded together and placed on skid supports as a continuous pipeline along the trench. During the welding operation, each weld will be visually inspected by a qualified inspector. Radiographic inspection of all welds will be performed, which exceeds DOT regulations.

It is expected that pipe delivered to the construction area will be protected with an external coating of fusion bond epoxy (14 mil minimum) or an extruded polyethylene coating. After the welds are inspected and before the pipe is lowered into the trench with sideboom tractors, the welded joints will be coated and any defects or scratches that penetrate the pipe's external coating will be repaired. A cathodic protection system will be employed to minimize potential corrosion of the pipeline.

Additional inspections will be performed to ensure that:

- The trench is of adequate depth to achieve the minimum cover required over the pipe;
- The bottom of the trench is free of rocks, tree limbs, tree roots, and other debris;
- The pipe is properly placed on the bottom of the trench;
- All bends conform to the alignment or contour of the trench; and
- The external coating on the pipe is not damaged.

If the bottom of the trench is rock, a sand or soil padding will be placed in the bottom before the pipe is lowered into the trench. Padding may consist of sand bags or foam pillows.

After the pipe is lowered into the trench, inspected and approved, the trench will be backfilled using a bulldozer, rotary auger backfiller or other suitable machine. In general, backfill will consist of the material originally excavated from the trench. In some cases, material from other areas may be used as backfill. For example, rock would not be backfilled directly onto the pipe unless first crushed on-site to prevent damage to the pipe. Where such materials are encountered, earth or sand may be hauled in and deposited around the pipe to form a cushion or pad. No topsoil will be used for such padding. Instead, a man-made protective shield known as "Rockshield" may be wrapped around the coating of the pipe. The backfilling operation will involve the replacement of subsoil in the trench, followed by the replacement of topsoil over the subsoil layer. Any excess excavated materials, or materials unsuitable for backfill, will be disposed of in accordance with applicable regulations and landowner requirements.

During backfilling, construction procedures will be implemented to minimize erosion, restore the natural contour of the ground, and allow normal surface drainage. On cultivated and improved lands where the topsoil is conserved, the subsoil and topsoil will be separated for stockpiling, and will remain segregated at the edge of the construction ROW. Following installation of the pipe within the trench, the stockpiled subsoil will be used to backfill the trench; trench backfill will be compacted. The stockpiled topsoil will be placed over the subsoil to provide an approximation of the surrounding undisturbed soil horizons. Excess backfill material will be bermed over the ditch centerline to permit natural settling. Appropriate steps will be taken, such as installing water diversions with the berming, so water will not be channeled along the berm. To prevent erosion along the trench in sloping terrain, burlap-type sacks filled with sand or foam-type or bentonite breakers will be placed within and across the trench. Where the trench intersects with streams, wetlands, or groundwater and where site conditions may result in drainage from the intersected body of water, the trench will be sealed with impervious materials such as sack breakers or clay. Sub-drains will be installed if the trench intercepts any springs.

Special Installation Techniques

The methods of installation described above apply to most of the terrain that will be encountered during construction. However, special techniques will be applied to some portions of the ROW. These areas include crossings of streams (particularly rivers, roads, railroads, utilities, and canals). Typical methods of construction for these areas are described below.

Stream and River Crossings

All but one crossing of streams and rivers will be constructed using the open-cut method where the trench will be excavated by tracked backhoes moving through the bed of the flowing stream. At the crossing of the Yellowstone River, the pipeline will be installed using directional drilling techniques instead of trenching and backfilling (Figure 2-6). Based on the results of selected boring locations, directional drilling has been determined to be feasible in this area due to the presence of a hard blue gray shale. Directional drilling techniques will reduce construction impacts as there will be no direct contact or alteration of the Yellowstone River (Figure 2-7).

A wet-ditch construction method has been selected for the Beartooth Pipeline flowing stream crossings (Figure 2-8). The open trench method will be used for all dry stream crossings. Construction procedures for crossing of flowing streams have been designed to be reactive to the depth, width, and flow of encountered courses. These procedures have been specifically developed to minimize the impacts of construction activities on water bodies by allowing for more rapid completion of trench excavation, pipe installation, and backfilling operations while controlling excessive erosion and sedimentation. Utilization of the wet-ditch construction method for flowing stream crossings will limit the turbidity in the water while construction is taking place. Turbidity will increase only during the brief periods of flume pipe placement and removal.

Clearing and grading in the vicinity of flowing streams will involve the installation of sediment barriers across the pipeline ROW on either side of streambanks; the appropriate degree of grading along streambanks and the width of ROW to minimize disturbance; and the removal and stockpiling of streambank topsoil behind an earthen berm in the adjacent upland area within the ROW.

The crossing of dry streams will follow open trenching procedures. Open trench stream crossings will involve excavating a trench across the streambed (Figure 2-9). Excavated material is placed on the stream bank of dry streams, or piled in the stream channel of larger dry streams where the backhoe reach is not adequate to place the spoils on the bank. If the trench, as it approaches the stream crossing, would encounter shallow groundwater, a temporary plug of undisturbed ground would be left in the trench as long as possible to reduce the amount of silt-laden water entering the stream. The water would then be pumped from the trench to stable well-vegetated areas. Straw bales or silt fences would be used where necessary to prevent this water from flowing back into the trench. Sediment barriers would be constructed where necessary to prevent runoff from disturbed areas from entering the stream channel. Silt fences or straw bale sediment barriers would be installed at streambanks or wetland boundaries prior to construction and would be maintained until adjacent upland areas are successfully revegetated. Other "dry" stream crossing methods such as dam and pump, or flumed crossings, are not expected to be utilized.

Preparation of access to streams will also be performed to minimize riparian, streambank, and instream disturbance. In most cases, the stream crossings will be narrow. Flume pipe culverts or temporary bridges will be installed, as necessary, across the streams to provide access to the work areas on both sides of the stream. This will minimize streambank degradation and erosion, and sediment flow into the waterway. Culverts will be stabilized using clean gravel. Diversions will be used to channel the upstream flow through the culvert(s) and to stabilize the trailing edges of the culvert(s). Low-flow streams, streams with solid rock or gravel channels, and dry streams may be crossed without the installation of flumed access points. All equipment will be cleaned and inspected prior to entering a stream, and no leaking equipment will be allowed within the waterway. Refueling of equipment will be conducted beyond 100 feet of any stream bank.

In flowing and dry streams, trenching will be accomplished using a backhoe which will only enter the stream as necessary to complete work. Handling of the material excavated from trenches will vary with local conditions. If possible, all material excavated from the trench will be temporarily stockpiled out of the water. Trench spoil will be removed from the streambed, and stockpiled and segregated from the stream bank topsoil in the adjacent upland area behind an earthen berm, lined with a silt fence. On larger streams where the backhoe reach cannot extend to place spoil on banks, material excavated from the trench can not be stockpiled out of the water. At these crossings, the material will be stockpiled on the downstream side of the trench. Gaps will be left in the stockpiles through which the water can flow.

The timing and duration of construction in streams and rivers is important to resource management agencies. To the extent possible, crossings of streams and rivers would be constructed when streamflow is low or non-existent. Also, the segment of pipe to be placed in the stream or river would be assembled before the trench is excavated to facilitate quick installation once the trench is open. Preassembled (strung, welded, and x-rayed) section(s) of pipe will be transported and lowered into the trench using side-booms or similar equipment. Piping will be weighted using concrete coating to prevent flotation, where necessary. In general, actual work in the stream or river should be completed in 1 or 2 days. However, the time during which the trench would be open could be longer if blasting of rock in the streambed is required.

Backfilling of trenches is generally accomplished using a backhoe. Once the pipe is placed in the trench, the original spoil material will be used to backfill the trench. Sand, gravel, or dirt will be used as padding where rock is present in the trench.

In addition to the procedures described above, several other procedures will be followed at all crossings of streams or rivers. These procedures are:

- confining work to allotted ROW and temporary work space (note that additional temporary work space would be required at most crossings);
- staging areas will be located a minimum of 100 feet from watercourse crossings;
- maintaining unexcavated areas known as "hard plugs" at the banks until just prior to installing the pipe across the watercourse;
- minimizing disturbance of approach slopes and banks;
- obtaining proper authorization, where appropriate, prior to in-stream work;
- maintaining existing streamflow at all times;

- minimizing duration of in-stream work by having the necessary equipment and materials for pipe installation on-site and assembled prior to trenching (i.e., the watercourse section of pipe will usually be welded, coated, weighted and tested prior to commencement of ditching); and
- providing passage for fish during spawning migrations if construction is permitted to proceed during such times.

Although all the procedures previously identified will apply to all crossings of streams and rivers, additional procedures may be used at crossings of streams or rivers that are particularly sensitive environmentally. Crossings that may be considered sensitive to pipeline construction include those where:

- water intakes are present downstream of the crossing;
- species of special concern to state and federal agencies are present at, or downstream from, the crossing;
- special concern habitats (e.g., wetlands or fish spawning areas) are present at, or downstream from, the crossing;
- fish migrate through the crossing area;
- the crossing or downstream area has high recreational value;
- the crossing and its immediate environs have high quality visual qualities; or
- the watercourse is navigated by recreational boat traffic.

Cleanup and restoration in the vicinity of stream crossings will include the following:

- Construction equipment and debris will be removed from the streambed and banks;
- Streambank topsoil will be replaced;
- Streambanks will be seeded and mulched. Curlex matting or other suitable erosion control materials will be utilized to anchor streambank areas with unstable soils;
- Riprap or similar type material will be installed along streambanks subject to streamflow erosion and generally where streambanks have a slope steeper than 2:1. Riprap will be placed from the streambed to the top of the streambank. The riprap will be of sufficient size and density to prevent its transport by stream flow. The use of riprap should be well thought out with regards to stream characteristics such as historical ranges of stream flow volumes and velocities ("normal" flow and storm related high flow), stream depth and channel width, overall stream channel morphometry (meander and runs) above and below the point of interest, and streambank slope. If not used appropriately, the use of riprap can create as many problems as it solves. For example, riprap may direct stream flow into the opposite bank, causing erosion. A properly designed pipeline can allow for the natural dynamics of a stream to occur (e.g., a pipeline buried deeply enough across a floodplain could allow for stream

channel migration back and forth over the pipeline without compromising the integrity of the facility). In some areas, riprap could be used to prevent stream flow on the outside of a curve from preferentially eroding the trench;

- Bottom contours will be reestablished; and
- Banks of the watercourses will be restored and stabilized to approximate preconstruction condition.

Crossings for vehicles will be installed at most watercourses if approved by permitting agencies. However, if the crossing is too large, such as the Yellowstone River, construction traffic will use existing bridges and new or existing access trails on either side of the crossing. In general, vehicle crossings will consist of temporary bridges, swamp mats, or culverts and ramps constructed of clean fill. Construction vehicles will not ford flowing streams unless approval is obtained from the appropriate authorities as described previously. Upon completion of construction, the vehicle crossings will be removed and the beds and banks of the stream restored to approximate preconstruction condition.

Crossings of Highways, Railroads, and Utilities

Specific construction techniques for each road crossed along the route will be negotiated with the agency having jurisdiction such as the DOT, State of Montana, and Wyoming Highway Departments, and county planning commissioners in the three counties crossed by the pipeline. Highways, developed roads, and railroads will be crossed primarily by conventional boring. At road crossings, the depth of the ditch will conform to appropriate regulations. At these crossings, standard specifications require a minimum of 4 feet of cover between the top of the pipe and the lowest point of the bar ditch, or a minimum of 5 feet of cover between the pipe and the top of the road surface, whichever dimension provides the greatest depth.

Where ground conditions prevent boring and where permitted by authorities having jurisdiction, highways or roads will be open-cut in stages to maintain traffic flow. Most undeveloped roads will be open-cut. During construction, every reasonable effort will be made to eliminate delays or public inconvenience at such crossings and to otherwise avoid restriction of normal traffic flow. At these crossings, appropriate safety procedures will be implemented to prevent injuries to workers and to the public. Flagmen or devices to notify the public of construction (e.g., traffic controls, night flashers and markers) will be used as deemed necessary by the construction supervisor, safety engineer, and authorities having jurisdiction. Cross-over locations will be provided along open trenches, cuts, mounds, and strung pipe to permit passage by people and animals.

In general, underground utilities will be crossed by boring underneath or by carefully exposing the pipeline or cable by hand. Where electrical transmission line and pipeline ROWs are intersected, restoration programs will conform to the owner's requirements.

Crossings of Irrigation Canals

Irrigation canals will be crossed by boring underneath or by open cutting, depending on site-specific conditions. If feasible, the crossing will be constructed when water is not flowing in the canal. If boring is not technically feasible, the canal will be trenched during the dry season or crossed by temporarily directing water around the construction site. The canal bed and banks will be re-compacted and restored to preconstruction condition as soon as possible. When crossing canals, borrow ditches or irrigation ditches that are dredged to maintain depth, the concrete-coated pipe will be installed to a depth that will permit safe dredging operations with a minimum of 5 feet of cover.

Crossings of Drainage Tile Fields

The pipeline may cross agricultural areas with drainage tile systems. However, the number of these crossings encountered by the pipeline will be few. During construction, temporary measures will be used to ensure that drainage systems continue to function effectively. Any drain tiles damaged, cut or removed during the pipeline construction process will be repaired or replaced.

Wetlands

Given the arid climate in affected portions of Montana and Wyoming, there are relatively few permanent wetlands crossed by the route. Most of the wetlands are linear features associated with streams. Construction will generally be timed to coincide with the dry period when water tables are low and wetlands are most likely to withstand moving equipment. Special methods may be used to install the pipe in wetlands (Figure 2-10). All construction methods implemented will be in accordance with the Section 404 permit issued by the COE. Specifically, during clearing and grading within the vicinities of wetlands, all equipment will be cleaned and inspected prior to entering a wetland. Equipment found to have leaks will not be allowed in wetland areas. Clearing and grading will entail the (1) placement of sediment barriers (silt fencing, straw bales, and/or diversion terraces) across the pipeline ROW on either side of a wetland area; (2) minimization of the width of ROW disturbance; (3) woody vegetation, such as trees and shrubs, will be cut to ground level and cuttings will be removed from the wetland areas; (4) non-woody vegetation will be cut and removed using standard construction methods; (5) grading will not occur within the wetland boundaries; and (6) stream crossing construction specifications will be utilized for streams encountered within wetland areas.

Trenching may proceed across wetlands with the aid of swamp mats and low bearing pressure equipment to reduce impacts to wetland vegetation and soils. All construction equipment and vehicles will be restricted to the mats. Other trenching procedures will include: topsoiling and ditching using a backhoe or dragline operating from mats; removing wetland topsoil to a depth of 12 inches for the width of the trenchline and stockpiling in the adjacent wetland within the ROW; trenching to a depth sufficient to cover the pipe with a minimum of 36 inches of backfill; and sidecasting trench spoils into the adjacent wetland, segregated from the topsoil.

Construction of temporary access roads with geotextiles and fill is currently not envisioned. Hard plugs will be retained to prevent mitigation of water along the ditch, and ditch breakers will be installed as required to prevent permanent drainage of wetlands. Prior to pipeline installation, lengths of pipe sufficient to cross wetlands will be preassembled (strung, welded, and x-rayed) on the adjacent upland ROW; these sections of pipe will be installed by carrying or dragging the pipe into place. Side-booms or similar equipment from mats will be used to carry and lower the pipe into the trench. If dragging the pipe to the trench is necessary, the previously made-up pipe will be floated into place using a push/pull method. The pipe will be weighted by means of a concrete-coating to prevent flotation, as needed.

The stockpiled subsoil will be returned to the ditch, followed by replacement of the topsoil. Although pipeline padding is generally unnecessary in wetlands, the need for padding will be determined on a site-specific basis by the chief inspector and an environmental monitor.

Cleanup and restoration will entail the removal of excess spoils materials from the wetland and spread on the adjacent upland ROW; restoration of contours and drainage pattern to preconstruction conditions; and removal of all construction mats and other materials and supplies, as well as woody materials from clearing and grading activities from the wetland area. Generally, revegetation of the wetland ROW will not be necessary. Typically, the wetland area will revegetate naturally within 1 to 2 years after construction is completed. Final cleanup will be conducted as weather conditions permit.

Restoration of the ROW

After the completion of backfilling, all disturbed areas (including the permanent easement, temporary work space, temporary access roads and stockpile sites) will be restored to their original grades and original drainage conditions. Any excessively steep cuts which would be unstable if left in place will be graded back to an acceptable slope. In areas of excessively steep cuts, gabions (wire cages containing rock) could be used to stabilize the walls. Stabilization and regrading procedures and specifications will be outlined in the stormwater and erosion control plan. Any remaining trash, brush, or debris will be disposed of in an appropriate manner.

Finally, signs will be installed along the ROW (at crossings of roads, railroads, navigable waterways, and other locations as necessary) to clearly mark the pipeline's location.

After final grading is completed, the ROW will be protected from wind and water erosion and revegetated. Revegetation will be accomplished in a manner compatible with preconstruction vegetation patterns. The restoration and revegetation of the construction area will be completed to the approval of the landowner, the surface management agency, or other jurisdictional authority. On cultivated or improved lands, measures will be taken to relieve compaction (if necessary) and remove surface rocks in order to leave the ground surface in a condition satisfactory to landowners.

Stream and river beds will be returned to their preconstruction contours and banks will be stabilized as appropriate with riprap, sand bags, erosion control fabric, or log cribwalls. Where necessary at sensitive stream crossings, specific plans for revegetating the stream banks and approach slopes will be developed in consultation with the appropriate agencies and landowners.

After the final cleanup, the appropriate surface management agency and the landowners will be contacted to determine their satisfaction with the restoration of the ROW and temporary work space area. Thereafter, periodic aerial and ground inspections of the ROW will be conducted and further restoration and revegetation measures will be implemented if necessary.

Testing of the Pipeline

Once installed, the pipeline will be hydrostatically tested in accordance with the Federal Safety Standards of the Office of Pipeline Safety (49 CFR Part 105). Hydrostatic testing involves filling the completed pipeline with water and pressurizing the pipeline for a specific length of time. Testing will be conducted in segments. The length of each test section will depend on local topography. The hydrostatic test will be performed in sequence, where necessary, by transferring the water from one test section of pipeline to another.

Detailed hydrostatic testing plans and procedures will be finalized following the completion of the pipeline centerline profile. After the completion of a satisfactory test, the hydrostatic test water will ultimately be discharged in an approved manner and where permitted by state agencies.

The intake and discharge of water for testing will be in accordance with all applicable state water regulations and federal and/or state discharge requirements. Water for the Beartooth Pipeline project will most likely be purchased from a water right holder with a legal right to sell water. This action will involve the completion of a Change Authorization from the appropriate division of the MDEQ in Helena, Montana and will require the completion of a Water Agreement for

Temporary Use of Water from the State Engineer's Office in Wyoming. Test water will only be obtained from appropriate and approved sources. If test water is withdrawn from a lake or flowing stream, the withdrawal will be in accordance with the regulations of the appropriate federal, state, or local authorities. The water intake will be screened to prevent entrainment of fish. If possible and where permitted by state agencies, the test water will be used for successive hydrostatic test sections. Where this practice will not be possible, the water will be discharged on upland vegetated areas at a rate or in a manner that will minimize erosion. Methods to reduce erosion will include the use of energy dissipation devices, regulation of the discharge velocity, and regulation of the discharge areas. No discharge of water will be made without the appropriate discharge permits. If the test water is discharged into a dry waterway (i.e., an intermittent stream), the discharge rate will not be greater than the permit levels.

At the present time, it is not anticipated that any chemicals will be added to the test water. However, depending upon the ambient temperature, the test water may be heated and circulated to prevent freezing. The locations of the final tie-ins will be cleaned up and restored following hydrostatic testing.

2.5.3.2 Alternate Methods of Crossing the Yellowstone River

Several alternative methods of crossing rivers may be considered during the planning stage of a project. These include:

- trenching;
- directional drilling; and
- attachment of the proposed pipeline onto a pre-existing structure (e.g., a bridge).

Although trenching the Yellowstone River is a potential method of construction, it was not given serious consideration due to the requirements for an individual Section 404.

Alternate methods that were under consideration included the use of directional drilling and attachment to a pre-existing structure. Both of these methods are considered to create fewer adverse environmental impacts compared to trenching. The selected method of crossing the Yellowstone River is by the use of directional drilling.

Figure 2-6 illustrates the location of the directional drilling crossing of the Yellowstone River along the proposed route. Directional boring is a multiple-step process. First, a small-diameter pilot hole is drilled along the designed path. This hole is commonly drilled using a rig designed to drill at an angle from 8 to 18 degrees from the horizontal. A bentonite drilling mud system pumps mud through the drill pipe to power the drill bit and remove bit cuttings from the hole. The drilling mud will be spread on the ROW, in a location approved by the landowner, or hauled to a landfill. The drill path is designed for the depth and length of the crossing and the diameter of the pipe to be installed. The drill path is monitored electronically and the drilling system is adjusted to steer the drill bit along the required path.

After the pilot hole is completed, it is enlarged to the required diameter by reaming. As with the pilot hole, the mud system is maintained to remove material cut during the reaming. The final diameter of the hole is larger than the diameter of the pipeline that is to be installed through the bore.

In the final step, the pipe, which was assembled on the ground surface, is pulled through the borehole, hydrostatically tested, and welded into the adjoining sections of pipe. The sections of pipe pulled through the bore is usually treated with additional coatings to protect it from being mechanically abraded while being pulled through the hole.

2.5.4 No Action Alternate

Under the No Action Alternate, a pipeline will not be constructed to carry oil from the refinery at Billings to Elk Basin.

2.6 Economic Analysis of System Alternates

2.6.1 Introduction

Pursuant to its responsibilities under NEPA in the preparation of the Beartooth Pipeline EA, the MDEQ has conducted an analysis of alternatives to the proposed pipeline. DEQ characterized the impacts if the pipeline is built (the various Action alternatives) and if the pipeline is not built (the No Action alternative). Due to the small size of the pipeline, it is not required that "need" for the project be established. The following analysis is provided to help in determining the impacts of the facility, by providing an examination of alternatives to the project, with consideration of the economics of the various alternatives.

To help in this analysis, DEQ has used a report prepared by Energy Analysts International, Inc. (EAI), released August 1, 1995, entitled Evaluation of AEC Express Pipeline. That report identified alternatives to Alberta Energy Corporation's proposed Express Pipeline should that facility not be built, and compares those alternatives with Express on a cost basis. The present analysis draws heavily from the EAI report, to the extent that it still applies to petroleum industry conditions at the time of this writing. A copy of the EAI report is on file in the office of the Energy Division of MDEQ.

2.6.2 Basis of this Analysis

The relative merits of the proposed project and the No Action alternative are measured by a comparison of the benefits of the proposed action (which will be lost if the project is not built) minus the costs of the project (which will be avoided if the project is not built). Usually, if the benefits of a project exceed its costs, then the project is superior to the No Action alternative. Here, however, the situation is not as simple since several possible alternatives could provide roughly the same benefits as the proposed action. Estimating the magnitude of the benefits for each alternative is complex, therefore, it is assumed that these benefits will be roughly equivalent. Consequently, the comparison of the alternatives can be based on project costs.

2.6.3 Distribution of Project Benefits and Costs

Project benefits and costs have private and public, or social components. Private benefits include revenues that the pipeline owners gain from selling pipeline services, and any revenues gained by oil producers who might not have had a market for their products without the pipeline. Social benefits are the sum of all benefits gained by all parties involved in the project. Social benefits include any private benefits, plus any benefits that do not accrue to parties directly considered by the project, including parties not gaining directly from revenues created by the project. For instance, consumers could benefit indirectly from lower petroleum product prices, though they might not gain directly from paying less for oil.

Project costs also have private and social components. Private costs include pipeline construction and operating costs, while social costs include all private costs plus damages (costs) borne by the environment or society that are not mitigated during project construction or pipeline operation.

2.6.4 Project Risk and Public Resources

In general, since the public benefits of a project are likely to exceed the private benefits, the private feasibility of a project probably will ensure positive net benefits to society. However, this condition only holds if project costs unpaid by the project sponsor do not exceed the benefits to the rest of society. Moreover, if society makes sure a sponsor covers all project-related environmental and social costs, then there probably will not be any costs borne only by society. Society can insure that it does not bear the costs of a project by establishing environmentally sound construction standards and indemnifying itself against unforeseen mitigation costs through reclamation bonds or similar performance guarantees.

2.6.5 The Beartooth Pipeline Project Description

The proposed action is to construct the Beartooth Pipeline, a 78-mile long (approximate), 12-inch diameter crude oil pipeline. The Beartooth Pipeline would run from the southern terminus of Conoco's Glacier Pipeline system at Conoco's refinery at Billings, Montana, to the north end of Amoco's Big Horn Pipeline at Elk Basin Station in Wyoming. This pipeline would allow space vacated by Cenex on the Glacier system to be used for delivery of Canadian crude oil into Casper and Guernsey, Wyoming, then on to destinations in Utah and Colorado. Surplus capacity was created on the Glacier system when Cenex's Front Range Pipeline began operating in 1995. The Beartooth Pipeline will serve refineries in the southern Rocky Mountains via existing downstream pipelines through a hub at Casper, rather than through new direct connections to any refining centers. (Note: For this discussion, Rocky Mountain states include Colorado, Montana, North Dakota, Utah and Wyoming; and southern Rocky Mountain states include Colorado, Utah and southern Wyoming.)

Beartooth Pipeline's minimum design capacity would be 50,000 bpd. The actual volumes delivered would depend on southern Rocky Mountain refinery demand for incremental crude oil supplies to offset declining production in the Rocky Mountain states. Amoco and Conoco would initially ship 25,000 to 30,000 bpd of proprietary crude through the pipeline. They expect these proprietary volumes would increase by 1,500 to 2,000 bpd each year, to replace declining Wyoming production. The balance of oil volumes delivered over the pipeline would be owned by other parties.

The Beartooth Pipeline would cost about $18,000,000 to construct. Amoco and Conoco would each own 50 percent of the Beartooth Pipeline.

2.6.6 Petroleum Industry Setting and Basis for Alternatives

Declining Rocky Mountain crude oil production, coupled with increasing regional refined product demand, is creating conditions that call for some kind of action from the petroleum industry. This action could take the form of increased pipeline delivery capacity, refinery closures, reduced refinery crude runs and retraction of petroleum product exports from the region, greater refined product imports into the region, or some combination of these.

2.6.7 Rocky Mountain Crude Oil Production

Following the low world crude oil prices of the 1980s, oil drilling declined in the Rocky Mountain states. As a result, oil production has also declined in the region. EAI (1995) forecasts combined average crude oil production declines for the Rocky Mountain states of roughly 10,000 to 15,000 bpd over the next 10 years, for a decline rate of between 4 and 4.4 percent per year. That trend was not reflected in the 1994 decline rate of 8.4 percent, which was apparently related to unusually low oil prices. Since then oil prices have risen, and oil production in these states has increased. In 1995, crude oil production in these states showed a modest increase of 1.3 percent over the 1994 production level, but remained below pre-1994 levels (Crude Production Decline Update, 1996). However, Wyoming, the region's largest crude oil producer, experienced a 1.2 percent crude oil production decline in 1995.

Crude Production Decline Rates, Rocky Mountain States, 1993-1995

State	Average 1993 Production	Average 1994 Production	Average 1995 Production	1993-1994 Change	1994-1995 Change
Colorado	85,855	80,623	80,366	-6.1%	-0.3%
Montana	47,667	45,301	45,622	-5.0%	0.7%
North Dakota	84,728	75,459	80,358	-10.9%	6.5%
Utah	57,178	56,448	60,143	-1.3%	6.5%
Wyoming	243,723	217,884	215,263	-10.6%	-1.2%
Total Rocky Mountain States	519,151	475,715	481,752	-8.4	1.3

Units bpd, (-) indicates decrease, (+) indicates increase

While Rocky Mountain crude oil production has declined, demand for petroleum products has gradually increased in the region. As a result, southern Rocky Mountain refineries, which in the past have acquired their crude oil from the Rocky Mountain states, have recently begun to supplement their crude slates with supplies from outside the region. Due to the layout of the existing petroleum supply network, incremental crude oil supplies from outside the region have come primarily from northern Rocky Mountain oil fields in Canada.

2.6.8 The Rocky Mountain Crude Oil Pipeline Network

The Rocky Mountain region is served by only a few crude oil pipelines. Some of these pipelines, such as the Frontier and Butte Pipelines, move crude oil from producing areas within the region to southern Rocky Mountain refining centers. Others, such as the Platte and Amoco Pipelines, move surplus crude out of the region to Midwest (MW) markets.

Canadian oil currently moves into the Rocky Mountain region via the Rangeland-Milk River-Glacier Pipelines, mostly to Billings area refineries, or to markets south of Billings via the Wascana-Texaco-Butte Pipelines. As noted above, as Rocky Mountain crude oil production declines, southern Rocky Mountain refiners will probably get all of their incremental crude requirements from Canada. Currently, very little infrastructure exists that could be modified economically to transport oil from regions to the south, east or west.

Cenex built the Front Range Pipeline in 1995, a 16-inch, 65,000 bpd crude oil pipeline connecting the company's terminal at Santa Rita, Montana, (near Cutbank) to its refinery at Laurel, Montana. The pipeline's capacity could be expanded to 100,000 bpd with more pumps. This facility will probably increase Canadian heavy crude imports into Billings, while displacing to the south Big Horn Basin crude volumes that have moved north into Billings in the past. Operation of the Front Range Pipeline opened capacity on the Glacier system that could be used for imports of Canadian crude types to markets south of Billings via the proposed Beartooth Pipeline.

2.6.9 Rocky Mountain Refining Capacity

Rocky Mountain refining capacity is distributed among the states of Colorado, Montana, Utah, and Wyoming. Only refineries south of Montana are considered in this EA, as Montana would not be served by the Beartooth Pipeline. Southern Rocky Mountain refiners currently have about 372,000 bpd of refining capacity. Based on estimates from crude slates, about 288,000 bpd of this capacity requires sweet crude with the balance being sour and asphaltic crude capacity. All of the refineries in the Salt Lake City area are sweet crude refineries. Colorado's refining capacity is approximately one-half that of the other states, though the state consumes more products than any other state in the region. Rocky Mountain refineries are all accessible via existing pipelines to Canadian crude supplies delivered to Casper, Wyoming, and are thus potential markets for the Beartooth Pipeline.

2.6.10 The Rocky Mountain Refined Product Network

The Rocky Mountain refined product network spans Montana, Wyoming, Colorado, Utah, Idaho, northeastern Oregon and eastern Washington. Compared with the Gulf Coast, Midwest and Midcontinent, the Rocky Mountain pipeline network is simple. This network is composed of twelve major local refineries and ten major product pipelines. In addition, four minor refineries are serving localized areas. The Salt Lake City and Colorado Front Range areas are the two major markets served by this network. Locations of the Rocky Mountain refining centers and associated refined product pipeline network are identified in the EAI report.

The Rocky Mountain refined product supply network is relatively isolated from other regions. Most exchange with other regions occurs as imports to Denver, Colorado from Borger, Texas and El Dorado, Kansas. Major product volumes move from Texas Panhandle refineries via the Diamond Shamrock and Phillips Pipelines and from Midcontinent/Gulf Coast refiners via the

Chase Pipeline. These imports affect the Colorado Front Range market but do not physically travel further into the Rockies.

With a limited capacity for product imports, the Rocky Mountain region is a relatively captive market for refiners. The major competition for refined product markets is generated by the Texas Panhandle refineries (Phillips and Diamond Shamrock) and those refineries that supply the Chase Pipeline. Imports delivered to Denver compete directly for the Colorado Front Range market with refineries in Colorado, Wyoming and Billings, Montana.

Important product pipelines within the Rocky Mountains include Wyco, Continental, Sinclair, Pioneer, Chevron, and Yellowstone Pipelines. Product exports from the Rocky Mountain to the east occur via the Cenex, Wyco, and Cheyenne Pipelines, and to the west (eastern Washington) via the Yellowstone (from Billings) and Chevron (from the Salt Lake City area) Pipelines. The Yellowstone Pipeline recently lost its easement over the Flathead Indian Reservation northwest of Missoula, and has ceased shipping over that segment. As a result, Yellowstone gasoline volumes are reinjected in Thompson Falls, Montana for delivery to Spokane, Washington. Diesel and jet fuel are currently shipped via railroad tank cars to Spokane.

2.6.11 No Action Alternatives

Should the Beartooth Pipeline not be built, crude supply alternatives include different ways for refineries to get crude oil. Because the demand for crude oil is derived ultimately from consumers' demand for refined petroleum products, refined product pipeline alternatives are also considered. Refiners could also respond to declining Rocky Mountain crude oil supplies by reducing product exports out of their primary markets, by reducing production to match the reduced oil supply, or by shutting down refining operations altogether.

The alternatives that do not involve pipeline construction would cost less than the pipeline construction alternatives, but may have other impacts on society such as loss of employment and tax revenues. Some alternatives require little or no change to the existing crude oil and refined product networks. Others, including the Beartooth and Express Pipeline projects require significant investments. Some alternatives, such as the changes will probably occur incrementally. With Express, the changes will occur more quickly. The individual choices behind these changes will be driven by competitive forces. Ideally, the resulting configuration of the Rocky Mountain petroleum industry could give the region petroleum products at the lowest price. However, because the market is so dynamic, predicting what this least cost combination may be difficult.

Alternatives to the Beartooth Pipeline include some combination of:

- Alternative crude supplies via other transportation routes (such as expansions or new pipelines);
- Closure of refining capacity or reducing crude runs;
- Additional refined products through import pipelines such that less crude is needed to be refined; and
- Retraction of refined products from export pipelines such that less crude is needed to be refined.

As stated above, Beartooth Pipeline's primary markets would be refineries in the southern Rocky Mountain states. In response to declining Rocky Mountain crude production, two other project sponsors, Express Pipeline Company and the owners of the Wascana-Texaco-Butte system, have announced plans for projects that would deliver more Canadian oil into the southern Rocky Mountains.

2.6.11.1 Alternative Crude Supplies Via Other Transportation Routes

Express Pipeline

The proposed Express pipeline is a 24-inch, 510-mile crude oil pipeline connecting Hardisty, Alberta, Canada to Casper, Wyoming. The United States-Canada border crossing would be at Wild Horse, Montana. Express would have 16 pump stations and an initial capacity of 180,000 bpd. Capital costs are estimated by Express to be $395,000,000 and the proposed tariff from Hardisty to Casper would be $1.35 (U.S.) per barrel. Express published economics are based on an initial throughput of 142,000 bpd in 1996 increasing to 260,000 bpd over 8 years. Following a steep Rocky Mountain production decline in the years 1993 and 1994, Express projected a 7.2 percent per year decline in Rocky Mountain oil production over the next decade. The pipeline has been specifically designed to replace that supply with crude oil from Canada. Express Pipeline's target markets would be refineries in the southern Rocky Mountain region (Wyoming, Utah, Colorado) and in the Midwest (Illinois, Indiana, Ohio, Michigan and Kentucky). To reach Midwestern refineries, the AEC Express pipeline would transfer shipments to the Platte at Casper. To reach Utah refineries, Express shipments would be transferred to Frontier or Amoco Pipelines at Casper. Express would have to compete for the Midwestern refinery market with crude oil from several other sources: with United States crude oil production from the Permian Basin of West Texas, the Midcontinent, the Gulf Coast, the Gulf Coast offshore, and with foreign crude types landed in the Gulf Coast and Canadian crude shipped via Interprovincial Pipe Line across Canada.

Crude oil supply for the Express Pipeline would be from Bow River, Husky, Gibson, and Chauvin Pipelines at Hardisty, Alberta. Interprovincial Pipe Line (IPL) also moves crude oil through Hardisty.

Wascana-Texaco-Butte System Capacity Upgrades

The Wascana-Texaco-Butte system consists of three separately owned pipelines running from Regina, Saskatchewan to Casper/Guernsey, Wyoming. Canadian oil reaches the system via a connection with the Interprovincial Pipe Line in Regina. In the past, this system has been a primary route for Alberta-sourced crude into the southern Rocky Mountains.

The capacity of the Wascana-Texaco-Butte system could be expanded at relatively low cost. Currently, the system's capacity is limited by the capacity of the Texaco Pipeline, currently at 34,000 bpd, and by tankage limitations at Wascana's Regina terminal, which creates scheduling problems and effectively reduces the system's capacity. The Texaco Pipeline is expandable to 45,000 bpd with pumping upgrades. Texaco has purchased two new pumps at a cost of $1,000,000 but has not installed them to date due to lack of demand for the capacity. Texaco is currently replacing bad pipe to handle anticipated higher operating pressures associated with upgraded capacity. With the pumps, the effective potential capacity increase on this system would be about 10,000 bpd, and could probably match incremental declines in Rocky Mountain crude oil production until at least the year 2005, depending on future decline rates.

The Wascana segment could be expanded to 77,000 bpd by adding a pumping station and additional pumping capability to an existing pump station. To expand capacity on the Texaco segment beyond 45,000 bpd, that segment would have to be looped (EAI, 1995). The entire Texaco segment is approximately 137 miles long. Assuming it would cost about $400,000 per mile to loop the pipeline, the total capital cost would be roughly $55,000,000. Such a project would presumably create enough capacity to meet southern Rocky Mountain refinery demand for Canadian crude beyond the year 2005.

Comparison of Beartooth Pipeline with Alternative Crude Oil Pipeline Projects

The Express Pipeline project would be the most expensive of the crude oil pipeline alternatives; Express pipeline capital cost would be $395,000,000 for 510 miles of pipe. The cost for expanding the Wascana-Texaco-Butte corridor would range from a few million to about $55 million, depending on how much additional capacity was created. The estimated cost of the Beartooth Pipeline would be $18 million for 75 miles of 12-inch pipe.

In the past, most Rocky Mountain crude oil pipeline alternatives have been sized to meet regional needs. The Wascana-Texaco-Butte and Beartooth Pipeline projects are phased, incremental adjustments to the system that use existing infrastructure, and would represent the continuation of that trend. In contrast, Express proposes a large scale, long-term change to the system, involving the construction of a large new facility. The Express Pipeline would greatly exceed the capacity necessary to replenish diminishing Rocky Mountain crude oil supplies, and would need to move significant volumes of crude to the Midwest. Moreover, Express would rely on the capture of significant crude oil transport volumes from existing pipelines.

In the end, the price of petroleum products will be the driving force shaping the Rocky Mountain petroleum industry. Existing Rocky Mountain crude oil pipelines (many mostly depreciated) can adjust tolls downward to compete with Express. Rocky Mountain oil producers, especially those taking premiums over posted prices for delivery to the Salt Lake City market, can give up premiums to retain markets when faced with the certainty of more Canadian imports. Moreover, the certification of the Express project would likely spur action from the sponsors of potential alternatives to Express. Until now pipelines have met crude oil demand with incremental adjustments. A project on the scale of Express could force them to make significant investments to insure the continued productivity of their assets.

2.6.11.2 Closure of Refining Capacity or Reducing Crude Runs

Several Rocky Mountain refineries are candidates for closure, based on lack of environmental upgrade investments, the type of crude they use (crude slates), corporate commitment, and market conditions. Based on crude slates and distillate hydrotreater plans, the closure candidates in the Beartooth Pipeline market area are Amoco-Salt Lake City, Phillips-Woods Cross and Total-Denver. Total, Frontier, and Conoco refineries in the Front Range face additional market pressure from the new Diamond Shamrock product pipeline.

These refineries use 25,000 to 50,000 bpd of crude each. A refinery closure would offset Rocky Mountain crude production declines, putting off the need for Beartooth Pipeline delivery capacity for 1 to 4 years each. In the short-term, a closure would possibly permit increased crude exports from the Rocky Mountain to Midwestern states via the Platte and Amoco Pipelines. A refinery closure would not create construction costs unless new product pipeline construction was required to meet existing product demand.

2.6.11.3 Additional Refined Products Through Import Pipelines

As noted above, the incremental Rocky Mountain petroleum supply could be refined products or crude oil, where historically it has been crude oil from within the region. Several product pipeline projects are expected that could change the historical equilibrium. In any case, more product imports could reduce the need for incremental crude oil supplies via Beartooth Pipeline. These projects are described briefly below:

Proposed 60,000 bpd Olympic Pipeline Segment from Puget Sound Refineries to Pasco, Washington

This project is currently in the permitting stage. The target date for this project is the summer of 1998 (EAI, 1995). With this pipeline, Puget Sound product would be shipped across the Cascade Range to eastern Washington rather than up the Columbia River on barges. It would have cost and environmental safety advantages over the current route. The decision to construct this product pipeline project is being driven by cost and environmental factors, and would not be affected by the construction of the Beartooth Pipeline. But as noted previously, this pipeline would probably offset Salt Lake City product exports, which currently run on the order of 5,000 bpd. Additionally, the Chevron product pipeline segment from Pasco to Boise may be reversed in conjunction with the Olympic project, further displacing Salt Lake City exports to eastern Washington and western Idaho. In the short-term, this would reduce Salt Lake City crude runs and the need for incremental crude oil supplies. Over the long-term, the growing Salt Lake City product market would absorb the retracted volumes.

Upgrades Of The Explorer Pipeline To Increase Midcontinent Product Supply Access to the Rocky Mountain Market Via the Chase Pipeline

Explorer Pipeline is expanding from Houston to Greenville (north central Texas) and increasing the capacity to transport product from Gulf Coast refineries into the Midcontinent and Midwestern market areas. This would tend to increase the availability of Midcontinent product supply to move into the Rocky Mountain market via Chase Pipeline. Chase has debottlenecked its pipeline which effectively added 25,000 bpd of capacity on the El Dorado to Denver segment. In addition to this pipeline expansion, Farmland is increasing the capacity of their refinery in Coffeyville, Kansas from 65,000 to 125,000 bpd in 1996.

The New Diamond Shamrock Products Pipeline Segment from Mckee, Texas to Colorado Springs, with Planned Expansion to Denver

This project is expected to be completed in the fall of 1995. In the short-term, the Diamond Shamrock import supply into the Rocky Mountain market could be limited to product volumes retracted from the Dallas market (EAI, 1995). The gasoline retraction volume level is approximately 12,000 to 14,000 bpd. This source will likely place competitive pressure on Colorado Front Range prices, reduce refinery margins, and may eventually accelerate refinery closures.

The interregional product pipelines currently being built in the Colorado Front Range area would have the most impact on demand for the services of the Beartooth Pipeline. Taken together, the Colorado Front Range area has about 30,000 to 35,000 bpd of excess refined product pipeline capacity delivering into an area where product demand is currently about 85,000 bpd. It is likely that future growth in the Colorado Front Range demand will be met with incremental refined product imports rather than crude oil for refining in the area.

2.6.11.4 Retraction of Refined Products from Export Pipelines so that Less Crude is Needed to be Refined

With product demand growth and refinery closures, refined product pipeline exports out of the Rocky Mountain region have been retracted. This has been occurring on the Chevron Pipeline from Boise to Pasco, the Cheyenne Pipeline from Cheyenne to North Platte, and the Wyco Pipeline from Casper to Rapid City.

Salt Lake City and Colorado Front Range area refiners are faced with direct competition from low cost refined product sources outside of the region. The ingress of low cost imports via the proposed Olympic Pipeline from Puget Sound to Pasco, Washington into the historical export market for Salt Lake City refineries could force retraction of Salt Lake City exports. Ultimately, Salt Lake City refiners could retract exports to Idaho, Washington and Nevada. Such retractions would lead to reduced crude runs, and possible refinery closures, thus decreasing the demand for Rocky Mountain crude oil supplies.

Competitive pressures from product imports could exacerbate the problems of the refineries mentioned above and force refinery closures. Proposed product pipeline projects by Chase and Diamond Shamrock could force closure of refineries in the Colorado Front Range area. Product volumes from closed Colorado Front Range refineries could be made up via Chase, Phillips, and Diamond Shamrock Pipelines. These retractions would delay the need for more crude oil delivery capacity over the Beartooth Pipeline.

2.7 Summary of Proposed Action

Amoco Pipeline Company and Conoco Pipe Line Company are proposing a joint venture, referred to as the Beartooth Pipeline, which will result in the construction and operation of a new 12-inch pipeline between Conoco's refinery in Billings, Montana and Amoco's Elk Basin Station in Wyoming. The proposed action is to construct and operate the Beartooth Pipeline as proposed by Amoco and Conoco. The evaluation of the proposed route and alternate route segments indicates that each of the alternates and the proposed route are permittable. The conclusion is based, in part, on engineering feasibility and the consideration of impacts to the project area natural and human environments.

3.0 Affected Environment

3.1 Socioeconomic Conditions

The social and economic environments are composed of a number of elements and attributes. A variety of factors such as population, employment, settlement patterns, infrastructure, income statistics, business and industry, and health and social services are all components of the socioeconomic environment. The states of Montana and Wyoming have been successfully settled, in part, due to the region's vast wealth in natural resources. Prominent commerce and business activities have been, and continue to be, in the areas of mining, agriculture, oil and gas, hydroelectricity, timber, and more recently, tourism.

The proposed pipeline will cross Yellowstone and Carbon Counties in Montana and a portion of Park County in Wyoming.

3.1.1 Population and Housing

3.1.1.1 Yellowstone County

Yellowstone County is located in the southwest portion of Montana, and represents a northern terminus for the proposed Beartooth Pipeline project. Yellowstone County is largely defined by the Billings metropolitan area. Within the project area, Yellowstone County-Billings is clearly the most metropolitan and densely populated locality. Billings, the county seat, is recognized as a regional "hub" for production and distribution of goods and services. Billings and Yellowstone County represent the regional center for the energy industry and agricultural-related business, as well as supplying educational opportunities and medical services (Billings Chamber of Commerce, 1995). The Yellowstone County-Billings area constitutes the largest concentration of people and services within the states of Montana, Wyoming, North Dakota, and South Dakota. The county comprises approximately 2,674 square miles (sq. mi.), containing rangeland, irrigated cropland, dry farmland, and scattered timber resources.

Yellowstone County is predominantly rural in total land cover. Settled areas, with the exception of the Billings area, are scattered and of low density. Towns and incorporated communities within the project area are largely those associated with Billings: Laurel, Billings Heights, and Broadview. The unincorporated communities of Hesper, Ballantine, Worden, and Pompey's Pillar lie within the vicinity of Billings. The county is predominantly characterized by the Billings metropolitan area; the remainder is open rangeland and agricultural land.

The estimated population for Yellowstone County in 1994 was 122,762, which represents an increase of 8.2 percent over the 1990 population (113,419). The cities of Billings and Laurel comprise the majority of the county population. The average annual growth was 2.9 percent between 1960 and 1994 (Billings Chamber of Commerce, 1995).

The largest proportion of the Yellowstone County population in 1990 was between the ages of 25 and 44. The following represents those age groups with the largest populations: 30-34, 35-39, 5-9, 10-14, and 25-29. The proportion of age groups is somewhat similar between Yellowstone, Carbon, and Park Counties.

County migration patterns have recently trended toward growth, with the county realizing a net immigration between 1970 and 1985 (Yellowstone County Planning Department, 1990). As of 1990, racial composition within Yellowstone County was predominantly white (95.2 percent). Other ethnic groups included American Indian (2.85 percent), African American (0.45 percent), Asian (0.54 percent), and others.

With respect to total land available, Yellowstone County is primarily rural in nature; however larger communities in the Billings-Laurel area have created relatively densely settled, urban areas. Housing is primarily in the form of single family dwellings, although multi-family structures occur within the more densely populated Billings metropolitan area. After experiencing a 10-year low in 1989, single family residence construction has increased markedly through 1994, with significant increases occurring between 1991 and 1992 (Billings Chamber of Commerce, 1995). The growth in the construction of multifamily dwellings has paralleled single family structures, experiencing a boost in total number between 1992 and 1993. The construction of commercial buildings has also followed this same general pattern of growth.

The Billings area offers a number of temporary housing options in the form of hotels, motels, rental properties, mobile home parks, and campgrounds. According to the Billings Chamber of Commerce, there are 29 hotels/motels, 4 bed and breakfast establishments, and lodging opportunities associated with Yellowstone National Park. Occupancy rates are generally high during the summer months and during the October-November hunting seasons. Local ski areas also increase occupancy rates during winter months (Table 3-1).

3.1.1.2 Carbon County

Carbon County is located in the southwest area of Montana, abutting Yellowstone County to the north and the Wyoming state line to the south. Carbon County covers approximately 1,675 sq. mi., which partially includes the Pryor Mountains, Custer National Forest, and Gallatin National Forest. Red Lodge is the county seat and represents the largest concentration of population in the county. The second largest town is Bridger. Overall, the county is characterized as predominantly rangeland. Forest, dry farmland, and a small percentage of irrigated farmland comprise the remainder of the county. Livestock is the principal form of agricultural income.

Relative to the Yellowstone County-Billings metropolitan area, Carbon County is smaller and more rural. The larger towns and settled areas within the vicinity of the project area include Bridger, East Bridger, Fromberg, Warren, Edgar, Joliet, and Bear Creek. Population has shifted somewhat over the past 50 years. The apparent trend between 1980 and 1990 was a net migration out of the county. County population declined approximately 2.3 percent between 1980 and 1990 with an overall net out-migration of 2.1 percent. Most recently, however, this trend has been reversed. In 1990, population within the county was 8,080, with an estimated 10.7 percent increase (8,947) projected for 1994. There was an overall increase of 14.1 percent within the county between 1970 and 1990 (Montana Department of Commerce, 1993a and 1993b).

Closer examination of the Carbon County population structure indicates that the largest groups by age are the following: 35-39, 10-14, 5-9, 30-34, and 40-44. Racial composition is predominantly white (98.7 percent), whereas American Indian (0.5 percent), Asian (0.2 percent), and others (0.5 percent) are less well represented. Projections of growth for the county by the year 2000 range from an increase of 1.2 percent to 16.0 percent (Montana Department of Commerce, 1993b).

Carbon County is considered a rural area which contains exclusively rural housing units. According to 1990 census figures, there were 4,828 housing units within Carbon County, an increase of approximately 11 percent over 1980 figures. Housing is predominantly in the form of owner-occupied, single family dwellings. Approximately 27 percent of all housing units were rented in 1990. Growth in housing is evidenced by a 10.7 percent increase in the total number of housing units between 1980 and 1990. Temporary housing within Carbon County includes motels/hotels, and trailer and tent campgrounds (see Table 3-1). As of 1994, there were 8 motels within Carbon County. Known locations providing temporary housing services include Joliet, Fromberg, Silesia, Bridger, Red Lodge, and Roberts. With the exception of Red Lodge and Bridger, accommodations are primarily trailer grounds and campgrounds. Occupancy rates are generally high during the summer months (June through August), and increase during the hunting seasons of October and November. Skiers may also increase occupancy rates at hotels, motels and lodges during winter months.

3.1.1.3 Park County

Park County is located within the northwestern portion of Wyoming and borders Carbon County, Montana to the north. Park County covers a large expanse of land that includes both National

Park and National Forest lands. The county encompasses 5,231 sq. mi. Primary features within the county include Yellowstone National Park, Shoshone National Forest, Absorka Mountain Range, North Absorka Wilderness, and Washakie Wilderness. The City of Cody is the largest settled area in the county. Primary economic activity has been associated with the oil and gas industry, mining, timber, and agriculture. The landscape within the county is characterized by forest, rangeland, cropland, and oil and gas fields.

Cody, the most populated city in the county, lies to the south-southwest of the project area. Within the project area, settled areas include Ralston, Powell, Garland, Badger Basin, and Elk Basin. The total population within the county has increased 7.6 percent between 1990 and 1994, growing from 23,178 to 24,928 persons (Billings Chamber of Commerce, 1995). The communities of Cody and Powell experienced population growth from 7,897 (1990) to 8,539 (1994, estimated) and 5,292 (1990) to 5,687 (1994, estimated), respectively.

Based upon 1990 census figures, the largest sector of the population in Park County is between the ages of 25 and 44. Other age groups constituting a relatively large proportion of the county population include: 5-17, 45-54, 65-74, and 18-20. Approximately 28.1 percent of the population is under the age of 18, while 13.3 percent are over the age of 65. Racial composition indicates a predominantly white population (97.4 percent). Other races occurring in the county include African American (0.1 percent), American Indian (0.6 percent), Asian (0.5 percent), Hispanic (0.4 percent), and others (0.1 percent) (Wyoming Administration and Information, Division of Economic Analysis, 1995).

Park County is predominantly rural, with the exception of areas such as Cody, Powell, and Ralston. The county population is well centralized within the Cody-Powell area. The Wyoming Department of Administration and Information, Division of Economic Analysis classified 56.9 percent of the total Park County population as urban. Settlement has largely been influenced by oil and gas production and distribution, mining, and various forms of farming. The predominant housing type is single family, comprising 82 percent of the 1990 total housing units. Multi-family units make up a smaller percentage (approximately 12.2 percent), and mobile homes comprise roughly 15.6 percent of the total. Temporary housing is somewhat restricted. Hotels, motels, and ranches/lodges are available in the Cody area and in the vicinity of Powell and Lovell (Big Horn County). There are five motels/hotels, two bed and breakfasts, and seven mobile home parks in the Powell area (Powell Chamber of Commerce, personal communication). A variety of campgrounds and rental properties also provide temporary housing (i.e., apartments and rooms for rent) (see Table 3-1). Occupancy rates are variable throughout the year, however, seasonal increases typically occur between June and August, and during hunting seasons (i.e., October and November).

3.1.2 Employment and Income

3.1.2.1 Yellowstone County

The principal elements of the economic base in Yellowstone County are agriculture, energy related industries, trade and service, and tourism. In 1994, employment was estimated to include 76,163 individuals, including government employees. The two sectors employing the greatest number of people were services and retail trade, together comprising approximately 52.6 percent of the total work force. The government sector accounted for 12 percent, wholesale trade 8.4 percent, construction and manufacturing 9.9 percent, and farm related 1.3 percent (Billings Chamber of Commerce, 1995). According to 1994 estimates, the unemployment rate in the Billings metropolitan area has been gradually declining since 1988; dropping from a rate of 6.2 percent in 1988 to 4.0 percent in 1994. Figures generated by the Montana Department of Labor and Industry indicate that the civilian labor force unemployment rate for Yellowstone County in 1988 was 6.0 percent.

Per capita personal income (1992 data) was estimated to be $18,506. The industries supporting the highest wages (1994 data) included mining, manufacturing, and the federal government. Total personal income for Yellowstone County was $2,184,850,000 in 1992. The overall trend in the past 10 to 15 years has been an increase in the nonfarm economy.

Yellowstone County continues to be a primary producer of agricultural products, ranking second in the state for sugar beet production, third for corn and for grain, and fifth for winter wheat production. Livestock operations also contribute to the economic output of the county; the production of cattle and calves ranked third in the state of Montana, sheep and lamb production ranked nineteenth (Montana Agricultural Statistics Service, 1995).

Yellowstone County produced livestock and livestock products in 1993 earning $112,705,000 and $25,081,000 in crop products. The county ranked number one in the state for livestock associated products and twelfth for crop production. Specific agricultural products where Yellowstone County ranked in the top ten (1994) within the state included winter wheat, alfalfa hay, and sugar beets (Montana Agricultural Services, 1995).

3.1.2.2 Carbon County

Workers within Carbon County primarily work within the county; approximately 19 percent worked outside the county in 1990. For the same year, the civilian work force totalled 3,735 persons, which rose to 4,089 in 1994. The total employment figures for those years were 3,580 and 3,863, respectively, representing unemployment rates of 4.1 percent and 5.5 percent.

Although there was an increase in unemployment during that time period, the 1994 unemployment rate exhibited a decline relative to 1993 (5.9 percent). According to 1990 census data, the largest civilian employment sectors included agriculture, forestry, and fisheries (23.1 percent); retail trade (17.5 percent); educational services (10.7 percent); and construction (6.5 percent) (Montana Department of Commerce, 1993b).

Total personal income for Carbon County in 1993 was $150,037,000; nonfarm personal income constituted 88.3 percent of the total, equalling approximately $132,525,000. Farm personal income accounted for approximately 11.7 percent. Personal income derived from government employment (a component of nonfarm personal income) accounted for approximately 7.3 percent of the total personal income for Carbon County in 1993. The proportion of nonfarm and farm personal income was roughly the same for the years 1990 through 1993.

Private (i.e., nonfarm, nongovernment) businesses comprise 23.5 percent of the total personal income within the county. Government employment constituted 7.4 percent and farm related activities contributed 11.7 percent of total personal income in 1993. Per capita income was $17,388 in 1993. Personal income has increased between 1980 and 1993, with marked increases (relative to each preceding year) occurring during 1980, 1981, 1988, 1989, and 1993. There has been a steady increase in positive percent change in personal income between 1990 and 1993 (Montana Department of Commerce, 1993b).

Agriculture has traditionally been a predominant economic contributor in Carbon County. Based upon 1992 figures, Carbon County ranked first in the state of Montana in dry bean production, fourth in sugar beets, fifth in grain (corn), twelfth in stock sheep and lambs, and fourteenth in cattle and calves. In 1993, livestock and livestock products earned $37,662,000, ranking sixth in the state. Crops produced $15,871,000 for the same year (state rank of 22) (Montana Agricultural Statistics Services, 1995).

3.1.2.3 Park County

In 1990 total employment in Park County was 13,677. By 1993, employment rose to 14,927, an increase of 9.1 percent. The total labor force for the same year was 17,389; the civilian labor force comprised 66.3 percent of the total. In 1990, the unemployment rate in the county was 5.7 percent. Those sectors with the greatest number of employees included retail trade (16.0 percent); educational services (11.8 percent); health services (8.2 percent); construction (7.7 percent); agriculture, forestry, and fisheries (9.1 percent); and mining (6.7 percent). Government workers accounted for 15.6 percent of the total work force (Wyoming Administration and Information, Division of Economic Analysis, 1995).

Traditionally, the major elements of the economic base in Wyoming include cattle ranching, mining, petroleum industry, and farming. These elements still play prominent roles in the economic activity of the state. Agriculture within the state is among the top three industries with cash income totalling about $880 million in 1994 (Wyoming Department of Agriculture, 1995). Park County ranks among the top counties in the state for the production of a variety of agricultural products. As of the close of 1994, Park County ranked first in barley, oats, and sugar beets; second in dry beans; sixth in corn (grain), eighth in all hay and all cattle; and eleventh in breeding sheep. The total 1994 value of crops and livestock was $82.8 million, which placed Park County as fourth in the state of Wyoming (Wyoming Agricultural Statistics Services, 1995).

Oil production has historically been a principal economic element within the county. Oil production was 582,368 barrels in 1993. Similar to other producing areas in the United States, however, overall production has declined in the past decade. Relative to 1988 production, oil production declined 29.0 percent in 1993, representing a net reduction of 238,428 barrels and a $168,132 reduction in royalties. Similarly, natural gas production has also declined. The reduction in natural gas production signified a decline of 68 percent between the years of 1988 and 1993), accounting for a loss of $297,654 in royalties.

In 1992, the total personal income for Park County was $442,938,000. The per capita personal income for Park County has recently risen from $16,187 (1990) to $19,661 (1993), representing an increase of 21.5 percent (Wyoming Administration and Information, Division of Economic Analysis, 1995).

3.2 Community Services and Facilities

Community services and facilities contribute to the infrastructure of an area and provide community definition. Community services include medical services, transportation facilities, police and fire protection, ambulance/emergency rescue services, utilities and sewerage, public school systems, churches, libraries, and local museums. Community facilities include parks, recreation areas, open space areas, and cultural and historic points of interest. Given the predominantly rural nature of the project area, services and facilities within the vicinity of the proposed pipeline are generally concentrated within, and near, the cities and more densely populated areas. Consequently, the services and facilities of those communities with larger populations (i.e., Billings, Laurel, Bridger, Red Lodge, and Powell) generally serve larger geographical areas, extending beyond municipal boundaries.

The Billings metropolitan area offers the greatest diversity and number of community services and facilities within the project area. For instance, the Billings medical community provides advanced health care services, which serve a region extending beyond the project area. Other medical facilities are located in Cody, Powell, Red Lodge, Lovell, and Laurel.

Each of the three counties within the project area provide varying levels of services for police and fire protection, public schools, medical services, municipal/community water and sewerage services, electric and natural gas utilities, postal service, libraries, newspaper, radio and television stations, telecommunication services, and recreational resources.

Police protection within the project area is a blend of community-based police agencies within the larger towns and county sheriff departments. Sheriff departments typically have field stations within smaller communities in their respective counties (i.e., Carbon County Sheriff's Departments-Bridger and Joliet). Fire departments are largely manned by volunteers within the smaller communities throughout the three-county area, whereas larger communities maintain fire departments with full-time employees.

The principal public utility companies within the project area include Montana Power Company, Montana-Dakota Utility Company, and Yellowstone Valley Electric Cooperative. More heavily populated communities such as Billings, Laurel, Red Lodge, Roberts, Fromberg, Powell, and others operate community water and sewerage services. The remaining study area is serviced by individual on-site systems.

Educational services and opportunities are available throughout Yellowstone, Carbon, and Park Counties which include numerous public school districts and opportunities for continuing education. Institutions of higher learning include Montana State University-Billings; Montana State University-Billings College of Technology, Rocky Mountain College, Billings Business College, May Technical College, Northwest College, and various trade schools and adult education centers.

A broad spectrum of recreational opportunities and facilities exist within the vicinity of the project area. The region and natural landscape provide ample outdoor recreational opportunities including hiking/backpacking, camping, skiing, fishing, canoeing and boating, birding, and hunting. State and National Parks include Yellowstone National Park, Gallatin National Forest, Custer National Forest (Absaroka-Beartooth Wilderness), The Bighorn National Recreation Area, the Pryor Mountains, and Lake Elmo State Park. In addition, there are numerous historic and cultural points of interest throughout the region (i.e., Sacrifice Cliff, Chief Plenty Coups State

Monument, Boothill Cemetery, Lewis and Clark Trail, Bozeman Trail, Jim Bridger Trail, and Medicine Wheel).

3.3 Land Ownership

The identification of land ownership is an important aspect of the facility siting process as it has implications relating to the identification of appropriate permitting requirements. Permits may be required for crossing federal or state lands or roads (e.g., pipeline construction on BLM land generally necessitates a ROW and use permit, a temporary use permit, and consideration of the issuing of a federal ROW grant for permanent pipeline ROW). The crossing of some federal and state lands may also require site-specific impact assessments and practicable mitigation measures prior to construction.

Land within the project area consists of a patchwork of private and publicly owned lands (Figure 3-1). With respect to total area, land ownership within the project area is principally private (Table 3-2). Large contiguous tracts of public, single ownership lands are located outside the immediate project area. The Crow Indian Reservation occurs due east of the study corridor in Yellowstone and Big Horn Counties. A portion of the Custer National Forest lies south of the Indian reservation in Carbon County (see Figure 3-1).

The total area of Yellowstone County is 2,647 sq. mi. Of that total, 2,487 sq. mi., or 94 percent, is non-federal lands. State lands account for approximately 5 percent of all county acreage, covering 124 sq. mi. Federal lands cover 36 sq. mi. (1 percent) (NRCS, personal communication). Carbon County is somewhat smaller than Yellowstone County in total area (1,675 sq. mi.), but contains a greater percentage of federal lands (approximately 55 percent, 915 sq. mi.). State lands comprise 67 sq. mi., accounting for 4 percent of the total land area in the county; private lands account for 626 sq. mi. (37 percent).

Park County is the largest of the three counties that are encountered by the proposed Beartooth Pipeline project. The entire county encompasses 5,231 sq. mi. Of that total, 4,088 sq. mi., or 78 percent, is public land. The extent of public land largely occurs within Yellowstone National Park and Shoshone National Forest. BLM land occurs within the project area in the vicinity of Powell, Ralston, the Polecat Bench, Elk Basin, Badger Basin, and the Badlands Hills area. Private land generally occurs in and around towns (i.e., Cody, Ralston, Powell), amidst BLM and a few parcels of Bureau of Reclamation lands, lands in the Polecat Bench and oil field areas, and interspersed within the forest and park lands. Private lands cover 1,143 sq. mi., constituting 22 percent of the county.

Within the immediate vicinity of the project area, land ownership is comprised of private lands primarily in agriculture and rangeland, BLM property, and Montana and Wyoming state lands. Field reconnaissance of the project area indicates that north of the Bluewater Creek area in Carbon County is primarily private land with state land scattered throughout. South of Bluewater Creek, into the Elk Basin area, the frequency of BLM lands increases (see Figure 3-1).

BLM lands account for 0.2 percent of the affected environment (i.e., in the vicinity of the study alternates). Montana and Wyoming state lands account for 0.6 percent of the project area; the remaining are under private ownership (99.1 percent).

3.4 Existing Land Use and Vegetative Cover Types

Land use in the proximity of the alternate routes was investigated to confirm reported land use, and identify structures and ecological resources along each alternative. Land use along the potential corridors is largely agricultural; however, developed and recreational land use is also encountered. The digital land use mapping for the project area from the USGS Land Use and Land Cover Classification System (USGS, 1990) was used as the primary source of land use information for the project corridor.

Additional land use information was gathered and reviewed to assist in conducting the field reconnaissance. Those reference materials reviewed included:

- USGS 7.5 minute topographic maps;
- City of Billings Comprehensive Plan (1994);
- NRCS Yellowstone and Carbon Counties, Montana Soil Surveys;
- BLM Maps; and
- 1995 Aerial Photography along the Beartooth Pipeline proposed route.

As is presented in Table 3-3, land uses within the project corridor may be categorized into six broad types including, developed, agricultural, rangeland, forestland, water, and riparian/wetland areas. The following is a brief summary of the findings of the land use investigation. The distribution of land uses within the study corridors is presented in Figure 3-2. Dominant vegetation characterizing each land use is presented in Table 3-4.

3.4.1 Developed

Developed land uses as illustrated in Figure 3-2 consist of approximately 2.0 percent of the project corridors and may be further identified as consisting predominantly of industrial, commercial, retail, and residential development.

3.4.1.1 Residential/Commercial and Services

Concentrations of residential land use is present within the northern portion of the corridor in the Billings metropolitan area, comprising less than 1 percent of the study area. Outside of the metropolitan areas of Billings, Laurel, and Bridger, residential development is limited to individual homesites located on relatively large land parcels. Private residences are located in the area between Interstate 90 and the Yellowstone River south of the power plant. The majority of these residences appeared to have large lots, many of which are utilized to raise horses and cattle. Vegetation was dominated by grasses with isolated plantings of trees.

Commercial development and services are also typically associated with the more urbanized sections of the project area. Typical commercial development consists of strip development, gas stations, and grocery stores.

3.4.1.2 Industrial/Other Developed

Industrial land use is limited to a small area associated with the Billings metropolitan area. Industry is this area includes oil refineries, electric generating plant, and a gravel pit. Vegetation in this land type is generally limited to that which is characteristic of roadsides, fence lines, and the banks of the Yellowstone River. Vegetation is dominated by grasses with scattered clusters of trees. Those areas that are not actively industrial are predominantly characterized by exposed ground.

3.4.2 Agricultural

Agricultural land use is present within the alternate corridors, accounting for 17.5 percent of the project area (see Table 3-3). Two types of land use that fall into the category of agricultural land are irrigated cropland and dry farm cropland.

3.4.2.1 Irrigated Cropland

Irrigated cropland within the immediate project area is primarily limited to areas near the Yellowstone River and Bowler Flats west of the Pryor Mountains and north of Warren, Montana. Center pivot irrigation is utilized in the latter area while surface inundation from irrigation canals appears to be the method used to irrigate areas near the Yellowstone River.

Crops produced in these irrigated areas consist predominantly of feed grains, hay, and to some minor extent, sugar beets. At the time of the site reconnaissance, many of these fields were bare or contained stubble from the previous years' crops. Vegetation in these fields was limited to grasses along the fence lines. Faunal species observed included pheasant and mule deer.

3.4.2.2 Dry Cropland

Dry cropland is the predominant agricultural land use within the project area. Dry cropland areas appeared to be utilized primarily to raise livestock feed (hay) for harvest and to pasture the livestock. The greatest concentration of this land use extends north from the Bluewater Fish Hatchery to the southern banks of the Yellowstone River. Scattered throughout dry cropland are a variety of structures including fence rows, utility poles, underground cables and pipeline, cattle shoots, corrals, grain bins, and residences. Dry cropland is generally located on relatively flat terrain with limited water availability in areas where the soil has a minor rock content.

Vegetation was dominated by grass species utilized as livestock feed (e.g., timothy). On side slopes and areas used solely as pasture, sagebrush and other herbaceous species were a minor component of the total vegetative cover. Faunal species observed included pheasant, golden eagle, and mule deer.

3.4.3 Rangeland

Rangeland is the most frequently encountered land use in the study area accounting for 74.9 percent of the project corridors (see Figure 3-2). Agricultural use of this land type consists primarily of livestock grazing. Recreational uses also occur in this land use consisting of hunting, hiking, and horseback riding. Structures present along the corridors include railroad tracks, fence rows, utility poles, underground cables, and pipelines.

Rangelands of the project area vary in topographic elevation, occurring along ridgetops, side slopes, and bottomland areas. An area represented in this land use type is the steppe which is an environ considered to be too dry for natural forest on uplands. Steppes are grasslands dominated by short bunch grasses interspersed with shrubs and barren ground. Within the study area, rangeland vegetation is characterized by short bunch grasses interspersed with shrubs and barren ground. Common vegetation species include sagebrush (*Artemisia* sp.), rabbitbrush, squirreltail, bottlebrush, needlegrass, lupines, juniper (*Juniperus scopularium*), and prickly pear cactus (*Opuntia polyacantha*). A portion of the project from near Bowler Flats to Elk Basin can also be characterized as desert shrubland.

3.4.4 Forest Land

Forest land use consists of approximately 5 percent of the project corridor. The forest land is primarily limited to the higher, moister environs of the Pryor Mountains. Forest cover, however, does extend down into the foothills north Bowler Flats near Custer National Forest where alternate pipeline routes cross small patches of timber. Vegetation typically occurring includes pinyon pine, juniper, serviceberry, rabbitbrush, and a variety of herbaceous species. Riparian forest occurs along the Yellowstone and Clarks Fork of the Yellowstone Rivers. No faunal species were observed in the forest areas at the time of the site reconnaissance.

3.4.5 Open Space/Recreation

Parkland and recreational lands are not recognized as a distinctive land use category under the USGS Land Use and Land Cover classification system. Consequently, such uses are not identified on the mapping presented in Figure 3-3. However, recreational land use practices in the form of hunting, hiking, and horseback riding can occur in many areas of the project area, primarily in the open rangeland.

Several areas in the northern portion of the project area are designated as city parks by the city of Billings or as recreational areas by the BLM. One such area is Riverfront Park located between Billings and the Yellowstone River. The city park contains a large lake, open grass fields, woodlands, and wetlands. Facilities available at the park include roads, parking areas, picnic tables and shelters.

Vegetative species within the park and associated nature preserve are varied. Grasses and other herbaceous species are widespread throughout all regions within this land use. Woody species dominated by cottonwood are abundant throughout the nature preserve and scattered throughout the remainder of the park. Palustrine emergent wetlands dominated by cattails are located within the nature preserve and along the perimeter of the park. Evidence of faunal species usage of this land type included magpies and mule deer.

The South Hills Recreation Area is located in the project vicinity (see Figure 3-1). This area is a recreational area located south of the Yellowstone River, south of Billings. It is currently used most frequently as a motorcycle climb area and offers numerous trails, a race track, and camping. Use of the area is most frequent in spring and fall.

Other recreational sites in the area include various campgrounds and state parks. One such park is Pictograph Cave State Park located southeast of Billings east of Bitter Creek (see Figure 3-2).

3.5 Transportation Systems

Roadways constitute the basic transportation system component within or adjacent to the study area. Interstate 90, which runs through Billings, Montana in the northern portion of the study area, is the main east-west transportation artery for the region. State Highways 212 and 310 are the predominant north-south roadways in the study area. Numerous two-lane paved roads, improved gravel roads, improved graded roads, and unimproved dirt roads also facilitate access to and from the study area.

In addition to roadways, the area is serviced by railway. The main Burlington Northern rail line parallels Interstate 90 in the vicinity of Billings. In addition, a rail line diverges from the main line at Laurel and follows State Highway 310 southward through Silesia, Edgar, Fromberg, East Bridger, Wade, Warren, and into and beyond Frannie, Wyoming.

Aircraft transportation is also available within the study area. A regional airport is located in Billings, Montana and a small landing strip is located between Billings and Laurel, Montana. A relatively small municipal airport is also located near Bridger, Montana.

3.6 Air Quality

The ambient air quality of the study area is generally excellent (Montana Department of Health and Environmental Sciences, personal communication). The Billings/Laurel area is the population and industrial center of the region. Outside this urban area, agriculture is the predominant economic activity including dryland farming and rangeland, and irrigated crops. Consequently, air quality monitoring efforts have been concentrated in the Billings/Laurel area. Monitoring facilities are not currently established or operational elsewhere in the study area.

In south central Montana, air pollution sources include power plants, oil refineries, a sugar beet refinery, a sulfur plant, calcium manufacturing, grain processing, asphalt plants, gravel crushers, home heating devices, automobiles, agricultural activities, wind erosion, and open burning.

Within the study area, the major air pollution problem involves sulfur dioxide in Billings and Laurel. In Billings, major sulfur dioxide sources include a coal-fired power plant, two oil refineries, a sugar beet refinery, a coke-fired cogeneration power plant, and a sulfur recovery facility. The major sulfur dioxide source in Laurel is an oil refinery. Other compounds of concern in the Billings/Laurel area include carbon monoxide, sulfur trioxide, and nitrogen oxide. Total suspended particulates (TSP) and particulate matter 10 (10 microns and under in size) are also a concern. The area around Billings has been identified as a non-attainment area for carbon monoxide, while the area in the vicinity of the Cenex refinery in Laurel is a non-attainment area for sulfate.

Billings and Laurel are situated along the Yellowstone River valley. The valley runs from southwest to northeast and is the predominant topographical influence on the airflow in the area. In Billings, cliffs and rimrock are located north and south of the river which tend to result in airflow channeling. Distances between the north and south rims are on the order of 1 to 5 miles. In Laurel, the valley tends to be somewhat wider. The cities of Billings and Laurel, and all of the industrial sources, are located along the river valley where nearby terrain is often higher than the highest smoke stacks.

Wind roses in the area are reflective of the valley orientation. The predominant wind direction is from the southwest, and the second-most predominant wind direction is from the northeast. Similar to other areas in Montana, the Billings/Laurel area experiences inversions in the fall and winter months. This causes pollutants to become trapped and concentrations to increase for extended periods. Inversion breakup occurring after sunrise causes built-up concentrations to lower to the ground and results in elevated pollutant concentration readings at monitoring stations.

Monitoring suggests that automobiles, coal-fired power plants, and oil refineries are probably the major factors affecting the air quality of the Billings/Laurel area. Outside this urban area, agricultural activities, wind erosion and open burning are probably the predominant factors affecting air quality. Beyond the urban area, compounds of concern and particulate concentrations in the remainder of the study area are reportedly very low to negligible.

3.7 Noise

Noise is commonly defined as the intensity, duration and character of sounds from any and all sources. Sound is produced when a noise source induces vibrations into the surrounding air, causing fluctuations in atmospheric pressure. Decibels (dB), units of sound pressure used to measure changes in atmospheric pressure caused by the vibrations, are logarithmic functions, and consequently, are not additive.

Primary factors that influence the measurement of noise in ambient air are frequency and duration. The normal human auditory system cannot clearly discern sounds below 100 Hz (Hertz or Hz is a measure of frequency or pitch) or substantially above 10,000 Hz, and sound occurring outside this range is not generally perceived as "noise." Researchers have developed an A-weighted noise scale (dBA) to describe sounds emanating in those frequencies that are most readily detected by normal human hearing. Table 3-5 lists some common levels of sound and their corresponding dBA levels. Sound duration is another important factor in determining cumulative noise impacts. Noise levels often are reported as the equivalent sound level (L_{eq}) and expressed as a weighted average (dBA) over a specified period of time; the L_{eq} integrates noise levels over time and expresses them as steady-state continuous sound levels.

Within the project area noise sources include mechanized equipment (e.g., farm implements, construction equipment, vehicular traffic on highways and secondary roads, aircraft, trains) and "natural" sounds such as wildlife, insects, and wind. Sources of noise are expected to be more numerous and of a wider variety in the vicinity of Billings and other developed areas, whereas more remote areas are likely characterized by natural sources.

3.8 Visual Resources

Visual resources of the project area are characterized by several different landscape units including:

- Developed landscape;
- Yellowstone River corridor;
- Rolling agricultural and native landscapes; and
- Arid semi-desert landscapes.

3.8.1 Developed Landscape

Landscapes at the northern terminus of the project, north of the Yellowstone River, may be characterized as an urban/industrial landscape unit. Views within this unit are typified by the views of industrial landscapes such as the Conoco refinery as well as residential development and transportation infrastructure (e.g., I-90).

3.8.2 Yellowstone River Corridor

The riparian corridor associated with the mainstem and CFYR represent a high quality visual resource within the project area. Bottomlands along these rivers are characterized by riparian vegetation communities (cottonwood, salt cedar, cattail) with irregular shapes caused by the meandering and braiding of the river channel. Bluffs lining the Yellowstone River to the south represent a marked visual feature on the landscape which, in conjunction with the view of the Yellowstone River itself, is not found elsewhere in the project corridor. A notably sensitive viewshed in this corridor includes that of Riverfront Park, a recreational area frequently used by the residents of the Billings area.

3.8.3 Rolling Agricultural and Native Grassland Landscapes

This landscape unit comprises the major landscape unit within the project area. Views are generally characterized by agricultural fields or native grasslands. Agricultural landscapes consist both of dryland farming viewsheds and irrigated landscapes such as those created by the circular center-pivot irrigation practices in the vicinity of Bowler. Native grassland landscapes consist of both rolling and flat rangeland landscapes which are interrupted by cliffs, buttes, and incised stream channels bordered by riparian zones.

3.8.4 Arid Semi-Desert Landscapes

In general, arid semi-desert landscapes are confined to the southern border area of Montana and an area of the southern terminus in Wyoming. Landscapes within this area consist of somewhat barren landscapes dominated by sagebrush communities.

3.9 Soils and Geology

3.9.1 Geological Features

The principal geologic structural feature evident within the study area is the north plunging Pryor arch. This broad anticlinal or arching structure is evident on regional geologic maps [AAPG, 1972; Montana Bureau of Mines and Geology (MBMG) and USGS, 1955] and appears as a continuation of the Bighorn Mountains uplift of Wyoming and Montana. The highest structural portion of the Pryor arch is in the Pryor Mountains where Paleozoic rocks are exposed along the southern axis of the arch. The nose of the arch is evident in the outcrop pattern of the Eagle Sandstone in the area of Billings and Laurel. The arch loses clear definition north of Billings. The study corridor is situated along generally west dipping Cretaceous formations on the west flank of the arch.

The south terminus of the corridor, Elk Basin, is located on the east flank of the Elk Basin anticline. The Elk Basin anticline is a much smaller feature than the Pryor arch.

The proposed routes also cross two major fault zones (Feltis, 1988): the northeast trending Fromberg fault zone and the east-southeast trending Nye Bowler lineament. According to Qamar and Stickney (MBMG, 1993), these fault zones are in an area of extremely low seismic activity. Damaging earthquakes due to movement on these faults is not expected. The Fromberg fault zone crosses the west flank of the Pryor arch and structurally is generally downdropped on the northwest side of the zone. The northernmost portion of the fault zone is nearly parallel with a portion of the northern section of the proposed Beartooth Pipeline and forms the structural trap for the Mosser Dome oil field. The Nye-Bowler lineament is a series of east-southeast trending fault strands with movement downward on the north side of the lineament. The easternmost portion of the lineament intersects the southern proposed pipeline route segments near Black Butte Dome.

With the exception of the Yellowstone River floodplain area, the surface geology of the northern portion of the study area consists predominantly of Cretaceous sandstone and shale. Where the proposed project corridor leaves the Yellowstone River valley it crosses strata of the lower portion of the Cretaceous Montana Group or upper Colorado Group. Toward the south, the trend is for route segments to cross older formations. In the area just north of the Pryor Mountains, the route segments cross lower Cretaceous formations including the Lakota and Dakota formations or their equivalents.

In the middle portion of the study area, the corridor crosses the west flank of the Pryor Mountains. In this area, the surface geology consists of Jurassic, Pennsylvanian, and possibly Mississippian rocks. The Jurassic Morrison formation and Ellis Group consist of sandstone, siltstone, shale, and minor amounts of limestone. The underlying Tensleep and Amsden formations consist of massive sandstone and dolomite/limestone, respectively. The upper portion of the Mississippian Madison Group, which may outcrop in this area, consists of massive but generally porous limestone.

In the southernmost portion of the study area, proposed pipeline segments leave the flank of the Pryor Mountains and cross Cretaceous rocks. Near the Montana-Wyoming state line, routes cross a northern extension of the Bighorn Basin which is underlain by Paleocene Fort Union formation (Love and Christiansen, 1985). The corridor terminates near the Elk Basin anticline, which is an oil producing structure.

3.9.2 Mines and Mineral Resources

Inquiries at the MBMG in Butte and Billings indicate that mining activities have occurred within, or adjacent to, the study area since the settlement of the region. Historic mines established in the area attempted to extract economically viable quantities of bentonite, brick (clay), building stone (sandstone), chromite, coal, copper ore, gold, gravel, gypsum, limestone, manganese, oil and gas, shale, uranium, and vanadium. Current mining ventures within or adjacent to the study area include bentonite, coal, chromite, gravel, oil and gas, and limestone.

3.9.3 Geological Hazards

Documented information regarding geologic hazards within the study area is limited. General seismic information covering the study area was available for review. Maps indicating landslide deposits were available for part of the northern portion of the study area, but maps for the remainder of the study area are not yet available. Figure 3-3 identifies the area of landslide potential in the northern portion of the project area. Publications and/or mapping efforts which specifically address liquefaction potential within the study area are not currently available

(MBMG, personal communication). Information obtained regarding seismicity and landslide deposits within the area of interest, and a general description of the components necessary for liquefaction, are presented in the following paragraphs.

Inquiries at the MBMG in Billings, Montana, indicated that a landslide map (comprised of the Billings West, Billings East, Soda Springs NW, and Yegen 7.5-Minute Topographic Quadrangles) had been generated for the northern portion of the study area. Review of this map indicates that there are several isolated landslide deposits located on the south bank of the Yellowstone River south and southeast of Billings, Montana. Further, the Bitter Creek drainage contains the majority of mapped landslide deposits, with many of these deposits located near the mouth of Bitter Creek. MBMG staff is currently working on mapping landslide deposits in much of the southern portion of the study area. Mapping efforts are expected to be completed in the spring or early summer of 1996.

Seismic activity has been more extensively monitored and documented than other geologic hazards in the study area. A zone of earthquake activity, known as the Intermountain seismic belt, runs through western Montana. It extends from northwestern Montana southward to southern Utah (Smith and Arabasz, 1991). In the vicinity of Yellowstone National Park, a branch of the Intermountain seismic belt extends west into east-central Idaho. This westward branch is known as the Centennial tectonic belt (Stickney and Bartholomew, 1987). Earthquakes within these two seismic regions typically occur 3 to 10 miles below the surface of the earth.

Most of the known active faults in Montana are located within the Centennial tectonic belt. However, several active faults are located within the Intermountain seismic belt. Although active faults are located within these seismically active zones, earthquakes in Montana cannot be correlated with specific faults that are visible at the earth's surface except for earthquakes which exceed magnitude 7.0. Apparently, small- to moderate-magnitude earthquakes in this region occur at depth on small, discontinuous faults that do not extend to the surface.

Review of MBMG and Wyoming State Geological Survey (WSGS) earthquake epicenter maps indicates that no earthquakes with a magnitude of 5.0 or greater occurred in the study area for the period from 1925 to 1959, and no earthquakes with a magnitude of 3.0 or greater have occurred in the study area for the period from 1960 to the present. However, the maps also indicate a seismically active area in the vicinity of Yellowstone National Park, located approximately 60 miles west of the Elk Basin oil fields (MBMG, 1982-1992; WSGS, 1995; and National Oceanic and Atmospheric Administration, pre-1982).

The study area has been designated a Seismicity Zone 1 by the International Conference of Building Officials. Damaging earthquakes are not expected within this zone designation.

As noted above, documented liquefaction information is not available for the study area. However, it may be useful to present some general information and identify the typical hydrogeologic setting required for a "quick" condition to exist.

A "quick" condition may be naturally on-going or may be induced by a seismic event. Soil zones may "liquify" near the surface, or this phenomenon can occur at depth. In general, a "quick" condition exists when the upward flow of groundwater through sand-sized material reduces the shear resistance of the soil to zero. This assumes that flow velocities are high enough and the soil formation is adequately competent and/or homogeneous. At this point, the shear resistance of the soil material equals that of water (shear resistance of water equals zero), and the soil will not support a typical load. While no liquefaction areas are currently documented within the study area, pipeline construction engineers should be mindful of the possibility.

3.9.4 Soils

3.9.4.1 Yellowstone County, Montana

Soils in Yellowstone County, Montana fall into two general categories which include soils of the shale and sandstone uplands; and soils of the river terraces, low alluvial fans, and floodplains. Table 3-6 and Figure 3-3 identify soil associations found within the project area.

Identified river terrace, low alluvial fan and floodplain soil associations include only the Haverson association (see Figure 3-3). This association is characterized by level to gently sloping deep loams that are underlain by loam and silt loam. Soils in the Haverson association typically exhibit a moderate in-place permeability, are moderately to highly corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically greater than 60 inches below grade and the soils exhibit low stability in a ditch or embankment scenario.

Identified shale and sandstone upland soil associations include the Bainville-Travessilla-Rock land, the Pierre-Lismas-Kyle, and the Maginnis-Absarokee associations. The Bainville-Travessilla-Rock land association is characterized by steep to moderately steep, shallow to moderately deep loams and fine sandy loams underlain by clay loam to fine sandy loam. Soils in this association typically exhibit a low to moderate in-place permeability, are mildly to highly corrosive to untreated steel pipe, and exhibit a low shrink-swell potential. Bedrock is typically encountered between 10 and 40 inches below grade and the soils typically exhibit low stability in an embankment scenario. The Pierre-Lismas-Kyle association is characterized by moderately steep to rolling, shallow to deep silty clays and clays underlain by clay. Soils in this association typically exhibit a low in-place permeability, are highly corrosive to untreated steel pipe, and exhibit a moderate to high shrink-swell potential. Bedrock is typically encountered between 10 and 60 inches below grade and the soils typically exhibit low stability in an embankment scenario. The Maginnis-Absarokee association is characterized by undulating to steep, shallow and moderately deep soils with a predominantly clay loam subsoil. Soils in this association typically exhibit a low in-place permeability, are moderately to highly corrosive to untreated steel pipe, and exhibit a low to medium shrink-swell potential. Bedrock is typically encountered between 4 and 40 inches below grade and the soils typically exhibit low to moderate stability in an embankment scenario.

The Pierre-Lismas-Kyle and Maginnis-Absarokee associations are the most extensive in the Yellowstone County study corridor.

3.9.4.2 Carbon County, Montana

Soils in the Carbon County, Montana study corridor fall into two general categories which include nearly level to steep, shallow to deep, well drained soils of the shale and sandstone uplands; and nearly level to steep, moderately deep to deep, well drained soils of the intermediate terraces and fans.

Identified shale and sandstone uplands soil associations include the Waden-Cabba-Rentsac, Absarokee-Sinnigam, Kyle, and Midway-Travessilla associations (see Table 3-6 and Figure 3-3). The Waden-Cabba-Rentsac association is characterized by strongly sloping to steep, shallow, well-drained clay loams, silty clay loams, and channery loams. Soils in this association typically exhibit a low to moderate in-place permeability, are highly corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically less than 20 inches below grade in this association. Soils in the Absarokee-Sinnigam association are characterized by gently sloping to moderately steep, shallow to moderately deep well-drained clay loams and Channery clay loams. Soils in this association typically exhibit a low to moderate in-place permeability, are moderately to highly corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically less than 40 inches below grade and the soils typically exhibit medium stability in an embankment scenario. The Kyle association is characterized by nearly level to strongly sloping, deep, well-drained clays. Soils in this association typically exhibit a low in-place permeability, are highly corrosive to untreated steel pipe, and exhibit a high shrink-swell potential. Bedrock is typically greater than 60 inches below grade and the soil typically exhibits low stability in an embankment scenario. The Midway-Travessilla association is characterized by steep to strongly sloping, shallow, well-drained silt loams and silty clay loams. Soils in this association typically exhibit a low to high in-place permeability, are moderately corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically less than 20 inches below grade and the soil typically exhibits low stability in an embankment scenario.

Identified soils of the intermediate terraces and fans include the Harvey-Stormitt and Nunn-Wormser associations. The Harvey-Stormitt association is characterized by nearly level to steep, deep, well-drained loams. Soils in this association typically exhibit a moderate in-place permeability, are highly corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically greater than 60 inches below grade and the soils typically exhibit low to moderate stability in an embankment scenario. The Nunn-Wormser association is characterized by nearly level to gently sloping, moderately deep to deep, well-drained silty clay loams and loams. Soils in this association typically exhibit a low to moderate in-place permeability, are highly corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically greater than 30 inches below grade and the soil typically exhibits low to moderate stability in an embankment scenario.

The Waden-Cabba-Rentsac, Absarokee-Sinnigam, Midway-Travessilla, and Harvey-Stormitt associations are the most extensive in the Carbon County study corridor.

3.9.4.3 Park County, Wyoming

At a minimum, soils in the Park County, Wyoming study corridor fall into the following category: nearly level to steep, moderately deep to deep, well drained soils of the intermediate terraces and fans. Identified soils in this category include, but may not be limited to, the Harvey-Stormitt association. As mentioned above, this association is characterized by nearly level to steep, deep, well-drained loams. Soils in this association typically exhibit a moderate in-place permeability, are highly corrosive to untreated steel pipe, and exhibit a low to moderate shrink-swell potential. Bedrock is typically greater than 60 inches below grade and the soils typically exhibit low to moderate stability in an embankment scenario.

3.9.4.4 Problem Soil Types

Certain soils may have characteristics or qualities which may affect or inhibit the ability to revegetate and reclaim as a result of disturbances (i.e., grading, excavation). This section presents a semi-quantitative comparative analysis of soils along each alternate route which may be considered potentially problematic.

The following is a coarse analysis, and is based on the most limiting characteristics presented by any horizon in a soil series or complex. Soil series that have been identified as potentially problematic do not necessarily present reclamation problems. The analysis is intended for coarse screening for comparative purposes of alternate routes and for estimating the maximum area along each route that may require special reclamation mitigation. Final delineation of problematic soils needs to be completed in the field and mitigation measures should be addressed in the reclamation plan.

The factors that may affect soil reclamation, as identified in the Express Environmental Impact Statement (EIS) (1995) and personal communication with NRCS soil scientists, include the following:

- high electrical conductivity (EC) > 8 mmhos/cm;
- high sodium adsorption ratio (SAR > 8);
- steep slopes (slope > 15%);
- high clay content (content > 40%);
- high sand content (content > 85%);
- surface stone cover (stone content > 75%);
- depth to bedrock (depth > 20 inches);
- pH (pH > 8.5);
- presence of topsoil (unsuitable as a source of topsoil); and
- salinity (qualitative "high").

The comparative analysis, presented in Tables 3-7 through 3-9) is based on the soil maps and tables of soil characteristics presented in the soil surveys completed for Yellowstone County (1972), Carbon County (1975), and preliminary copies of soil survey maps and tables for Park County. However, soil surveys for adjacent counties do not present the same soil characteristics and did not include all of the above factors. The lack of data consistency precludes a strict quantitative analysis.

The most significant limiting factors of soils in Yellowstone County are associated with high clay content or thin soil over bedrock (see Table 3-7). In Carbon County, the most limiting factors include shallow depth to bedrock, high clay content and high pH (see Table 3-8). In Park County, Wyoming, the most significant limiting factors include high pH, surface slope, and clay content (see Table 3-9).

3.10 Water Quality and Aquatic Ecology

3.10.1 Surface Water

Dominant surface water features of the project area are presented in Figure 3-4. The project area consists of streams which fall within the Middle Rocky Mountain or Montana Valley and Foothill

Prairie Ecoregions. The Middle Rocky Mountain Ecoregion is characterized by rugged mountains and intermontane valleys, whereas the Foothill Prairies consist of rolling to dissected valleys and small mountain ranges (USGS Water Resource Data MT-94-1).

The project study area traverses the watersheds of the Yellowstone River, the Clarks Fork of the Yellowstone River (CFYR), and the Shoshone River. Any proposed pipeline route from Billings to Elk Basin will cross the Yellowstone River. The Yellowstone River drains approximately 140 sq. mi. of the study area. Streams within the study area that flow directly into the Yellowstone River flow predominantly in a northerly direction. The Yellowstone River, located south of the city of Billings, is the nation's longest free flowing river in the continental United States and will have to be crossed by the Beartooth Pipeline to reach the oil fields in Elk Basin. The Yellowstone River is the largest stream system within the study area, draining approximately 11,795 sq. mi. The Yellowstone River eventually flows into the Missouri River.

The CFYR drains approximately 500 sq. mi. of the study area. Streams within the study area that drain into the CFYR flow predominantly in a northwesterly direction. The CFYR flows for 72.6 miles (from the Montana-Wyoming border) before it joins the Yellowstone River near Laurel, Montana. There are 11 major diversion dams located between the border and its confluence with the Yellowstone River. Two of these diversion structures, Dry Creek and Orchard Canal, are tall concrete structures that have been documented by MDFWP to inhibit the passage of fish. The other diversions are constructed of gravel, boulders, and concrete slabs. Some diversions contain iron rail posts, set on end for the placement of straw bales. Most dewatering occurs during late summer and fall for irrigation purposes. The Clarks Fork has numerous silty irrigation return flows and is also occasionally plagued by slugs of silty-grey sediment, originating out of Big Sand Coulee which enters the Clarks Fork 1.7 miles downstream from the Montana-Wyoming line (MDFWP Report, F-20-R-29 Job II-a).

In general, most streams likely to be affected or crossed are ephemeral or intermittent streams. These streams are characterized by having coarse gravel and sand substrates. These streams are between 3 and 10 feet wide with varying depths. Flow is predominantly determined by snow melt runoff or heavy rains. The streams range between high flow in spring to minimal or no flow during late summer. Examples of these stream types within the study area include Bitter, Basin, Davis, Spring, Little Cottonwood, Cottonwood, East Fork Duck, and North Fork Bridger Creeks. There are also several perennial streams with potential of being impacted by the pipeline project.

Perennial streams occurring within the study area generally range between widths of 5 and 20 feet wide. The exception to this will be the Yellowstone River which is greater than 100 feet wide. These streams vary in depths and have areas with typical riffle, run, and pool habitats. The perennial streams flow throughout the course of the year with greatest flows during spring months. Substrate types include gravel, cobble, boulders, sand, and silt. Perennial streams occurring within the study area include Yellowstone River, Blue Creek, Duck Creek, North Fork Five Mile Creek, Five Mile Creek, Bluewater Creek, North Fork Bluewater Creek, Sage Creek, and their tributaries.

Streams potentially affected by the project in Wyoming are Sage Creek and Cottonwood Creek. Sage Creek is a perennial stream which has a low gradient and exhibits greatest flow during spring. The stream width ranges between 5 and 10 feet wide with varying depths. Cottonwood Creek is an intermittent stream with a low gradient. The stream width ranges between 5 and 10 feet with varying depths. Highest flows occur in spring and minimal flows usually occur during the summer. The streams are usually high in turbidity with peak flows caused by snowmelt runoff or heavy volumes of precipitation.

Numerous stock ponds, small reservoirs, and small lakes, ranging in size from less than an acre to several hundred acres are found within the study area. Several springs are also identified, particularly in the Spring Creek and Bluewater Creek drainages.

Some general surface water quality information is available for several surface water bodies within or immediately adjacent to the study area. These surface water bodies include Bluewater Creek, CFYR, Cottonwood Creek, Duck Creek, Silvertip Creek, and the South Fork of Bridger Creek.

The water quality of Bluewater Creek has been affected by rangeland use, agriculture, flow regulation/modification, and irrigated crop production. These factors have assisted in slight to moderate thermal modifications, flow and habitat alterations, and increases in suspended solids and siltation. Water quality in the CFYR has been affected by rangeland use, agriculture, streambank modification/destabilization, petroleum activities, resource extraction, and irrigated crop production. These factors have caused slight to moderate thermal and nutrient modifications, pH adjustments, flow alterations, and increases in siltation, metals, salinity, total dissolved solids (TDS), and chlorides concentrations. Agriculture, silviculture, and irrigated crop production have been the major factors contributing to degradation of Cottonwood Creek water quality. These factors threaten water quality due to an increase in suspended solids and inorganics concentrations. Duck Creek water quality is apparently affected by natural causes. The results are slight alterations in salinity, TDS, chlorides, and other inorganic concentrations. Water quality in Silvertip Creek has been affected by irrigated crop production, petroleum activities, resource extraction, and natural influences. These factors have contributed in moderate to high nutrient modifications, flow alterations, and increases in suspended solids, inorganic concentrations, salinity, TDS, and chlorides. Agricultural activities have been the predominant influence on water quality in the South Fork of Bridger Creek. These activities have contributed to moderate alterations in suspended solids and nutrients.

3.10.2 Groundwater Resources

Potential sources of groundwater supplies present within the study area include Cenozoic alluvium, and Mesozoic and Paleozoic bedrock formations. A review of available well information indicates that depth to groundwater within the study area varies from just below the ground surface to approximately 750 feet below the ground surface.

The source of alluvial water within the study area is predominantly precipitation within the contributing mountain watersheds. Some precipitation recharges the shallow groundwater system directly, and that portion which becomes streamflow provides some recharge during the snowmelt runoff period and during the irrigation season. Another component of recharge to the alluvial system is transfer of water from sedimentary bedrock units adjacent to and underlying the alluvium. Alluvial sand and gravel deposits typically yield the largest quantity of water in the study area. Yields in excess of 500 gallons per minute have been reported from some locations. The chemical composition of water in alluvial deposits is variable depending upon location. The composition often reflects the effects of irrigation which can either decrease the mineral content of a groundwater supply, or cause leaching of salts which results in an increase in the mineral content of the water.

In the upper bedrock formations, sandstones are the principle sources of water for wells. Some Mesozoic sandstones in the study area have thicknesses on the order of several hundred feet. Wells completed in these sandstones generally yield less than 10 gallons per minute (Gosling and Pashley, 1973). Mesozoic formations that produce groundwater for domestic and stock use include the Eagle sandstone, Judith River formation, sandstone beds of the Claggett and Bearpaw shales, and the Lakota formation. Some water wells have been developed from the sandstone beds of the Colorado Group, including the "Dakota sandstone." The Telegraph Creek formation contains sandstone beds that yield some water to wells. Chemical-constituent diagrams indicate the chemical type of water from various bedrock units. Water from the Virgelle sandstone member of the Eagle sandstone to the top of the Bearpaw shale is a sodium chloride or a sodium bicarbonate type. Water from the "Dakota sandstone," other water-producing units in the Colorado Group, and the Telegraph Creek formation are also generally a sodium chloride or sodium bicarbonate type. Water from the Lakota formation is generally a sodium bicarbonate type with low dissolved-solids concentrations near the outcrop. As the water moves downgradient from the outcrop, the water becomes more mineralized and is a sodium chloride type (Feltis, 1988).

Groundwater is commonly encountered when drilling into sandstones, limestones and dolomite of Paleozoic age. Some of the most prolific water production in Montana has been from porous zones in limestone and dolomite in the upper part of the Madison Group. Water is also produced from the Tensleep and Amsden formations. Recharge for the bedrock aquifer systems in the study corridor likely occurs primarily in the Pryor Mountains. Some recharge may occur in the Beartooth Mountains as well. However, the extent of the effect of the Beartooth fault zone on groundwater movement into the adjacent areas is unknown (Feltis, 1988). Water from the Paleozoic rocks generally is a calcium sulfate type, which indicates the presence of gypsum in the rocks. Those sites with a calcium bicarbonate water type are generally on or near the outcrop where recharge occurs (Feltis, 1988).

3.10.3 Floodplains

Identification of the 100-year floodplain is an important component of any proposed construction project. Regulatory floodplains of the project area are presented in Figure 3-4 and were identified using the currently available Flood Insurance Rate Maps (FIRM) within Yellowstone County and Carbon County, Montana. However, FIRMs are not currently available for the Park County, Wyoming portion of the study area.

Floodplains of the project area include those associated with the following surface water systems:

- Yellowstone River from its confluence with the CFYR to the mouth of Unnamed Creek;
- Blue Creek from the end of the detailed floodplain study area to its confluence with the Yellowstone River;
- East Fork of Duck Creek from the end of the detailed floodplain study area to its confluence with Duck Creek;
- Duck Creek from the end of the detailed floodplain study area to its confluence with the Yellowstone River;
- Cottonwood Creek (north of Edgar, Montana) from the upper 100-year floodplain limit to its confluence with the CFYR;
- North Fork of Five Mile Creek from the upper 100-year floodplain limit to its confluence with Five Mile Creek;
- Five Mile Creek from the confluence with the North Fork of Five Mile Creek to its confluence with the CFYR;
- Bluewater Creek from the upper 100-year floodplain limit to its confluence with the CFYR;
- Jack Creek from the upper 100-year floodplain limit to its confluence with the CFYR;
- North Fork of Bridger Creek from the upper 100-year floodplain limit to its confluence with Bridger Creek;

- South Fork of Bridger Creek from the upper 100-year floodplain limit to its confluence with Bridger Creek;
- Bridger Creek from the North and South Fork confluence to its confluence with Jack Creek;
- Hunters Creek from the upper 100-year floodplain limit to its confluence with Cottonwood Creek (south of Edgar, Montana.);
- Cottonwood Creek (south) from the upper 100-year floodplain limit to its confluence with the CFYR; and,
- Sage Creek from the Crow Indian Reservation boundary to the Park County, Wyoming line.

The estimated 100-year floodplain area within the project corridor consists of approximately 13,000 to 15,000 acres.

3.10.4 Aquatic Ecology

Cool and cold-water streams are the dominant water regimes occurring throughout the study area. These waterways originate in foothills of mountain ranges and are directly influenced by annual snowfall and meltwater runoff. The colder water temperatures endemic to these types of systems are capable of supporting trout populations. Several trout species have been historically collected from these drainages and commonly occur there today. The game fish species most commonly encountered are brown trout, rainbow trout, mountain whitefish, and cutthroat trout. Of these, only cutthroat trout and mountain whitefish are indigenous to these waters. Common or abundant nongame fish species inhabiting these streams are white suckers, mountain suckers, flathead chub, lake chub, longnose sucker and longnose dace (Mike Poore, MDFWP, personal communication).

The CFYR and Yellowstone River are the largest stream systems in the study area. The Clarks Fork originates in the Beartooth Mountains near the Montana-Wyoming border. The upper 30 miles of the river in Montana contains a whitefish and trout fishery, but the lower 40 miles has a limited population of desirable game fish species in part due to the high turbidity (Mike Poore, MDFWP, personal communication). The Clarks Fork enters the Yellowstone River near Laurel and annually contributes a substantial sediment load. The mouth of the Clarks Fork marks the beginning of the transition zone between the cold water fishery characteristic of the upper Yellowstone River and the warm water fishery of the lower river (MDFWP, unpubl. data, 1988). In 1983-1984, the MDFWP performed a fish survey on the lower Clarks Fork and collected the following species: brown trout, rainbow trout, cutthroat trout, mountain whitefish, burbot, longnose dace, carp, flathead chub, goldeye, stonecat, mountain sucker, longnose sucker, white sucker, shorthead redhorse, river carpsucker, and sauger (MDFWP Report F-46-R-7).

The Yellowstone River's headwaters can be traced to Yellowstone National Park with Yellowstone Lake as the origin. The upper Yellowstone River has high water quality and supports a valuable trout fishery. The Yellowstone cutthroat trout and Westslope cutthroat trout, both species of special concern, are common in the upper Yellowstone River. Other special concern fish species include the blue sucker and northern redbelly dace x finescale dace hybrid (Mike Poore, MDFWP, personal communication). In 1987 and 1988, a survey conducted by the MDFWP showed that trout densities in the Yellowstone River upstream of the confluence with the Clarks Fork outnumbered those in the section downstream of the Clarks Fork by about two and a half to one in 1987 and about four to one in 1988 (MDFWP, unpubl. data, 1988).

Montana classifies streams based on the amount of habitat produced for relatively rare species, or important habitat for fish of special recreational and aesthetic values. There are four classification categories used in this process. Class 1 streams provide exceptional habitat for species of high value or interest. Class 2 streams contain moderate habitat for highly valued species and exceptional habitat for less highly valued species. Class 3 streams contain substantial habitat for highly valued species and moderate habitat for less valued species. Class 4 streams contain moderate fishing resources.

The Yellowstone River, which will be crossed near Billings, has been classified by the MDFWP as a Class 2 stream. It is the only Class 2 stream found within the study area. Class 3 streams potentially affected by the pipeline project include CFYR and Bluewater Creek. Sage Creek has been classified as a Class 4 stream. All other streams within the study area are unclassified.

The State of Wyoming has two agencies which evaluate and assess stream resources of Wyoming and catalog them according to specific criteria. The Wyoming Department of Environmental Quality (WDEQ) and the WGFD each have their own criteria for stream classifications.

The WDEQ assigns classifications to surface waters based on water quality standards (Wyoming's Water Quality Rules and Regulations, 1990). The WDEQ has four categories of stream classifications. Class 1 streams are surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Non point sources of pollution shall be controlled through implementation of appropriate best management practices. Class 2 streams presently support game fish, have hydrologic and natural water quality potential to support game fish, or include nursery areas or food sources for game fish. Class 3 streams include those presently supporting nongame fish only, have the hydrologic and natural water quality potential to support nongame fish only, or include nursery areas or food sources for nongame fish only. Class 4 streams are those which do not have the hydrological or natural water quality potential to support fish and include all intermittent and ephemeral streams (Wyoming's Water Quality Rules and Regulations, 1990).

In contrast, the WGFD utilizes various characteristics to calculate a value for a stream's aesthetics, availability and productivity. The WGFD weighs and combines each value to determine a stream's classification. Class 1 streams are premium trout waters-fisheries of national importance. Class 2 streams are very good trout waters-fisheries of statewide importance. Class 3 streams are important trout waters-fisheries of regional importance. Class 4 streams are low production trout waters-fisheries frequently of local importance, but generally incapable of sustaining substantial fishing pressure. Class 5 streams are very low production waters, often incapable of sustaining a trout fishery.

Streams at risk of potential impact in Wyoming include: Sage Creek, Cottonwood Creek and CFYR. Sage Creek is a perennial Class 3 stream and is the only stream which flows from Montana into Wyoming within the study area. Sage Creek contains important trout waters of regional importance and is a tributary to the Shoshone River which is a Class 3 stream. Fish species inhabiting Sage Creek include: brown trout, lake chubs, longnose dace, longnose sucker, white sucker, mountain sucker, flathead chub, and flathead minnow (Ron McKnight, WGFD, personal communication).

Cottonwood Creek originates as an intermittent stream Northeast of Elk Basin, Wyoming. Cottonwood Creek is a nongame fish production stream inhabited by longnose sucker, white sucker, and longnose dace. The CFYR is a Class 3 stream which is not directly at risk by construction in Wyoming.

3.11 Terrestrial Ecology

3.11.1 Terrestrial Ecological Characterization

The project area is located within the Northern Temperate Grassland Biome. Areas within Wyoming are referred to as the intermountain grassland. Mixed grasses predominate within the region. Regional climate is the primary force influencing floral species presence, abundance, diversity, range, and distribution. The semi-arid nature of the project area translates to low annual precipitation, making water availability the limiting factor affecting plant growth. According to Omnerik (1986), the project area crosses three ecoregions. The area including the vicinity of Billings, the northern portion of Yellowstone County, and northern portion of Carbon County has been identified as the Montana Valley and Foothills Prairie ecoregion. This ecoregion is generally characterized as subhumid grassland and semiarid grazing land with some irrigated land. Characteristic plants include wheatgrasses, fescues, and needlegrasses. The Middle

Rockies ecoregion generally includes the central portion of Carbon County. The primary features include high mountains, grazed and ungrazed forest and woodland, subhumid grassland, semiarid grazing land, and a small component of irrigated land. Natural vegetation types include Douglas fir, western spruce, bentgrass, sedge, fescue, and bluegrass.

The southern portion of Carbon County and most of Park County has been identified as occurring within the Wyoming Basin ecoregion. Predominant landscape features include plains with hills or low mountains. Land uses include subhumid grassland, semiarid grazing land, and grazed desert shrubland. The common grassland type includes sagebrush steppe. Typical plant species are sagebrush, wheatgrass, needlegrass, saltbrush, grasswood, juniper, and pinyon pine.

Terrestrial resources within the project area were investigated in order to develop a greater understanding of the presence and relative abundance of the existing community types. The terrestrial ecological setting has developed in response to a variety of factors including climate, topographic conditions, geology and soils, and land management techniques. Historic and current land use practices have acted as simultaneous forces determining cover type presence, abundance, and structure. Each of these elements has contributed to the nature and variability of the landscape. The primary environmental factors which determine vegetative establishment, presence, abundance, and growth rates include temperature, thermoperiodicity, light, moisture, soil condition, and air movement patterns.

For the purposes of project area characterization, terrestrial cover types were identified by the dominant community structure within a given area and are generally synonymous to the land use categories described in Section 3.4. Cover types were distinguished by predominant vegetative composition. The cover types occurring in the project area include rangeland, cropland, wetland/riparian areas, forestland, and developed (see Figure 3-2 and Table 3-3) and are discussed in Section 3.4.

3.11.2 Wildlife

Information used to determine wildlife presence within the study area was largely performed utilizing data of record, with the exception of incidental observations noted during the qualitative field reconnaissance effort for the EA. As such, it is important to note that occurrences and locations of federal and state listed species (i.e., threatened, endangered, species of special concern) were obtained through the review of USFWS and MNHP databases. Consequently, information regarding grouse leks, prairie dog towns, and locations of rare plant species is limited by the extent and locations of previous field surveys. Field surveys were not completed along the proposed route or the alternate route segments as components of the EA effort.

The variable habitat of terrestrial and wetland ecosystems in the study area support a diversity of wildlife species. Rangeland including sagebrush and grassland prairies occur over large expanses within the proposed project corridor. These areas may support wildlife such as pronghorn antelope, elk, bobcat, badger, whitetail jackrabbit, mountain cottontail rabbit, coyote, and prairie rattlesnake. Numerous avian species also utilize the grasslands and include such raptors as golden eagle, red-tailed hawk, prairie falcon, and Swainson's hawk; game birds such as ringed-neck pheasant, sharp-tailed grouse, chukar, gray partridge, and sage grouse; and non-game birds such as sage sparrow, Brewer's sparrow, sage thrasher, and western kingbird.

Forested lands, which are scattered along the study corridors are favored by species such as white-tailed deer, red squirrel, great horned owl, northern flicker, black-capped chickadee, gray jay, Townsend's solitaire, and western kingbird. Other species of wildlife potentially occurring in this habitat include jumping mice, harvest mice, mink, weasel, fox, elk, mule deer, pronghorn antelope, and numerous song birds. Woodlands characterized by pinyon pine and juniper may contain species such as gray fox, western screech owl, white-tailed deer, black-tailed jackrabbit, and brushy wood rat, and provide suitable nesting habitat for raptors such as ferruginous hawk and golden eagle.

Emergent, scrub-shrub, and open water wetlands are used by a variety of wildlife. Species found in the study area wetlands include muskrat, mallard, vole, bald eagle, red-winged black bird, northern leopard frog, and garter snake. Areas which are developed, such as residential and commercial, have a reduced species diversity and occurrence. Species occurring in these areas include canyon wren, Clark's nuthatch, lark sparrow, common raven, starling, prairie vole, and squirrel.

Desert shrubland located south of Bowler, extending into Wyoming offers cover and forage for a variety of faunal species. This habitat type is typically utilized by species such as mule deer, pronghorn antelope, desert cottontail, whitetail jackrabbit, coyote, sagebrush vole, and spadefoot. The sagebrush provides food, shelter, and nesting sites for many avian species including sage grouse, long-eared owl, northern harrier, ferruginous hawk, American kestrel, green-tailed towhee, Say's phoebe, Brewer's sparrow, and common poorwill.

Sage grouse (*Centrocercus urophasianus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) inhabit sagebrush areas of foothills and prairies in the proposed project corridor. As presented in Figure 3-5, numerous sage grouse leks (breeding grounds) are located in the southern portion of the proposed project corridor and are utilized by the grouse from March through April (MDFWP, Eustace, 1996).

The southern portion of the corridor also supports numerous black-tailed prairie dog (*Cynomys eudovicianus*) and white-tailed prairie dog (*Cynomys gunnisoni*) colonies in dry upland prairies (see Figure 3-5). The prairie dogs feed mostly on forbs and grasses, competing with grazing stock, but may also prey on grasshoppers and other insects. Populations vary from 5 to 35 prairie dogs per acre (Burt and Grossenheider, 1952).

Mule deer (*Odocoileus hemionus*) and pronghorn antelope (*Antilocapra americana*) winter in an area near the Bluewater Fish Hatchery (see Figure 3-5). The habitat consists of open prairies and sagebrush plains, and the species feed mostly on shrubs, twigs, weeds, and grasses.

3.11.3 Riparian/Wetland Areas

Generally, riparian and wetland areas provide more critical habitat needs for many species and support a greater concentration of wildlife species than any of the other land uses along the potential corridors. They are not only important islands of diversity within the vast upland land types, but provide a functional linkage between terrestrial and aquatic communities. They are responsible for producing the greatest amount of biomass per square meter than any other land use encountered (Hansen *et al.*, 1995).

Riparian and wetland areas generally comprise approximately 0.6 percent of the project corridors (see Table 3-3) and are primarily located along the primary river and stream systems of the area (see Figure 3-2). A narrow riparian area is associated with the banks of the Yellowstone River. While not located within the alternate corridors, the largest riparian and wetland complex area is associated with the CFYR. Wetlands associated with the Clarks Fork are largely emergent wetlands dominated by cattail. Sage Creek also supports a large emergent wetland complex in the area between Bowler and Warren, Montana. Woody species associated with these areas include cottonwood and willow. Other stream systems supporting narrow riparian zones include Duck Creek, Blue Creek, Five Mile Creek, Cottonwood Creek, Basin Creek, and Bluewater Creek.

Due to the arid climate in Montana and Wyoming, riparian and wetland areas are limited to narrow zones along perennial streams. Because of the narrow nature of many of these zones they are not represented on Figure 3-2. However, one wetland area, associated with the Riverfront Park Nature Preserve, is located north of the Yellowstone River. The majority of the riparian areas have been impacted by grazing. Wetlands along the corridors appear to be predominantly dependent upon existing surface water bodies, stream channels, and direct precipitation for the hydroperiods necessary for the growth of facultative-wet and obligate plant species.

The wetland systems present in the Wyoming portion of the project corridor are similar to those found in Montana. Wetland areas are associated with streams and topographically low areas.

Wetlands located in the area of Elk Basin are predominantly emergent wetlands located in minor drainages.

Common vegetative species observed include cottonwood, salt cedar, cattail, and various grasses. Other species that may be present include willow, teasel, rushes, and sedges. No faunal species were observed in the riparian and wetland areas at the time of the site reconnaissance.

3.12 Threatened, Endangered, and Sensitive Species

3.12.1 Terrestrial Species and Communities

The existence of threatened (T), endangered (E), and species of special concern in the study area was ascertained through literature review and agency consultation. Correspondence with USFWS, MDFWP, WGFD, and MNHP resulted in the identification of several listed species that may potentially occur in the project area (see Figure 3-5, Table 3-10). The list is limited to those species reported to occur within the project vicinity.

The threatened and endangered and species of special concern inhabit a range of communities. Grassland/sagebrush prairies contain a variety of species and many species are dependent on other communities for food and shelter. Black-tailed prairie dog (*Cynomys ludovicianus*) (state special concern) and white-tailed prairie dog (*Cynomys leucurus*) (state special concern) towns may be utilized by the black-footed ferret (*Mustela nigripes*) (federal endangered), burrowing owl (*Athene cunicularia*) (federal candidate), and mountain plover (*Charadrius montanus*) (federal candidate). The project area is within the historical range of the black-footed ferret. However, no documented populations are currently known to occur in the study corridor.

Numerous species use grasslands for foraging and shelter. The short-horned lizard (*Phrynosoma douglassii*) (federal candidate), sagebrush lizard (*Sceloporus graciosus*) (federal candidate), dwarf shrew (*Sorex nanus*) (state special concern), Merriam's shrew (*Sorex merriami*) (state special concern), and Preble's shrew (*Sorex preblei*) (federal candidate) can occur within this cover type.

Woodland areas support federal and state listed species. This habitat is used as shelter and a food source, but many species also forage in grassland prairies. Trees, caves, tunnels and rocks within forested areas are inhibited by fringed myotis (*Myotis thysanodes*) (federal candidate), spotted bat (*Euderma maculatum*) (federal candidate), Townsend's big-eared bat (*Plecotus townsendii*) (federal candidate), small-footed myotis (*Myotis leibii*) (state special concern), long-eared myotis (*Myotis evotis*) (federal candidate), long-legged myotis (*Myotis volans*) (federal candidate), yuma myotis (*Myotis yumanensis*) (federal candidate), and pallid bat (*Antrozous pallidus*) (state special concern). The spotted skunk (*Spilogale putorius*) (federal candidate) and loggerhead shrike (*Lanius ludovicianus*) (state special concern) also utilize the forest and grassland cover types.

Species which inhabit wetland areas such as lakes, ponds, and stream channels include bald eagle (*Haliaeetus leucocephalus*) (federal threatened) and peregrine falcon (*Falco peregrinus*) (federal endangered). These species utilize trees and cliffs for nesting. The bald eagle's primary food source is fish and the peregrine falcon relies on small birds, including swallows and shorebirds (Rare, Sensitive, and Threatened Species of the Greater Yellowstone Ecosystem, 1989).

Seven rare plant species potentially occur near Bluewater Creek area and the Bluewater Fish Hatchery. The species include parrot-head Indian paintbrush (*Castilleja pilosa var. longispica*) (state special concern), giant helleborine (*Epipactis gigantea*) (state special concern), rabbit buckwheat (*Eriogonum lagopus*) federal candidate), Joe-pye weed (*Eupatorium maculatum var. bruneri*) (state special concern), beaked spikerush (*Eleocharis rostellata*) (state special concern), and swamp milkweed (*Asclepias incarnata*) (state special concern).

3.12.2 Listed Aquatic Species

The pallid sturgeon has been documented within the Yellowstone River basin. However, according to Mike Poore of MDFWP, the pallid sturgeon has been found in the lower part of the Yellowstone River near its confluence with the Missouri River. Consequently, the pallid sturgeon is not expected to occur in the vicinity of the project area.

3.13 Wild and Scenic Rivers

The Yellowstone River has been recognized as a unique recreational opportunity within the region. However, it is currently not either listed or proposed for listing as a Wild and Scenic River.

3.14 Cultural Resources

Cultural resources are the physical remains of peoples' past use of an area and symbolize peoples' continuing relationship to that area. Cultural resources include artifacts, features, sites, districts, and landscapes.

Every ethnic group interprets cultural resources in terms of their group's traditional cultural values and beliefs. Indians in south-central Montana tend to view cultural resources as part of an interrelated system that has both physical and spiritual characteristics which must be respected.

Euro-Americans in the area tend to view cultural resources primarily as sources of information in their ongoing study of the past.

Ethnic groups with an ongoing interest in the cultural resources of the project area (the sections crossed by the proposed pipeline alternatives) are the Northern Cheyenne, Crow, and Euro-Americans. The project area was part of the Crow Reservation until 1891 (Hoxie, 1989). Currently, both the Crow and Northern Cheyenne have expressed an ongoing interest in the cultural resources and plants with traditional cultural uses found in the area. Medicinal and ceremonial plants from the west side of the Pryors around Warren are generally believed to be bigger, healthier, and more potent (Express, 1993; Peterson *et al.*, 1996).

South-central Montana including the project area is deceptively easy to characterize in terms of cultural resources. It was inhabited throughout prehistory (the last 12,000 years) by semi-nomadic hunters and gatherers. During the last 4,000 years, the primary focus of hunting was the buffalo. The dominant prehistoric site type in the area is the surface lithic scatter.

Other common prehistoric site types found in the area are stone feature sites, primarily tipi rings and cairns (rock piles). Rare prehistoric site types found in the area include burials, pictograph/petrogliph sites, bison kill/processing sites, vision quest sites, rock shelters, and sites containing ceramics (Deaver, 1984).

In the last 200 years, the Crow, Eastern Shoshone, Northern Cheyenne, and Northern Arapaho camped, hunted, and battled in the project area. Also during the last 200 years, Euro-Americans moved into the area. Their primary strategy of adaptation has been ranching/farming. As in other areas of Montana, many attempts were made to engage in small scale (160 to 640 acre) ranching/farming but most were unsuccessful. These attempts were responsible for producing the most common historic site type in the area, the homestead. The relatively low forage productivity of the area that limited the size and distribution of the prehistoric hunters and gatherers has also limited the success of the historic ranching adaptation to those who can control extensive amounts of grassland.

Other historic site types found in the general project area include transportation conduits (trails, roads, railroads), dumps, public facilities (schoolhouses, post offices, etc.), rural towns, monument localities (graves, commemorative markers), and rock art sites (historic graffiti). Transportation conduits are particularly important in the siting of modern linear developments such as the proposed pipeline. The people who build trails, roads, railroads, and pipelines tend to use the same type of topography, relatively flat lowlands. As a consequence, it is not unusual for modern linear facilities to crosscut historic linear sites.

Previous cultural resource work in the area crossed by the proposed pipeline is limited. One major area of work has been at 24YL1 and 24YL2, Pictograph and Ghost Caves, respectively. Extensive excavation conducted at these sites provided the data on which the first chronology of the archaeology of the Northwestern Plains was based (Mulloy, 1958). In the 1960s, Loendorf conducted an intuitive sampling of the Clark Fork drainage in Carbon County, Montana (Loendorf, 1967). In the late 1970s, the University of Montana did a systematic extensive survey on Polecat Bench in Park County, Wyoming (Munday, 1980).

Other cultural resource studies in the sections crossed by the proposed alternatives are scattered, relatively small-scale surveys and testing efforts. All are directly related to modern developments and compliance with Section 106 of the National Historic Preservation Act (NHPA). In Montana these include sewer, transmission line and highway surveys in the immediate vicinity of Billings (e.g., Fredlund, 1985), the survey and testing along the proposed Altamont and Express Pipeline routes, surveys for hatchery developments at Bluewater (Aaberg, 1984; Peterson *et al.*, 1996), three surveys of spring developments by the BLM (e.g., Taylor, 1991), a well pad survey (Lahren, 1982), studies related to the Montana-Dakota utilities, Warren to Elk Basin Pipeline replacement (Rosenburg, 1981; Rydalch, 1981), and highway related survey of U.S. 310 north and south of Warren (Lam, 1992). In the Wyoming portion of the project area, previous cultural resource studies [with the exception of Munday (1980)] are limited to well pad, pipeline, seismic line, and ancillary facilities surveys associated with the development of the Elk Basin oil field.

Table 3-11 lists the known cultural resources in the sections crossed by the proposed pipeline alternatives. Table 3-11 was compiled from site file searches in Wyoming and Montana, review of the General Land Office (GLO) original survey plats for the townships crossed by the proposed alternatives, and a general review of area maps. Table 3-11 includes both recorded and unrecorded cultural resources. Ms. Halcyon LaPoint of the Custer National Forest provided site locational data on sites located by the Pryor Mountain survey. This survey was conducted in the early 1970s on portions of the Crow Reservation and Custer National Forest. The legal descriptions of the sites recorded on the Pryor Mountain survey is often problematic since the surveyors were not using topographic quadrangles. Based on the data in the Custer National Forest files, it appears that none of these sites are in the project area (the sections crossed by the proposed alternatives) even though several were listed in the Montana State Historic Preservation Office (SHPO) files. In other cases where the exact location of a site is unknown from the site forms, the worst-case scenario is assumed, that the site will be crossed by the proposed pipeline.

3.15 Hazardous Materials

In the interest of identifying sites with known or suspected environmental contamination in the vicinity of the study corridor, numerous state and/or federal lists were reviewed. These lists included the following: Montana National Priority List (NPL), Montana Non-NPL, Duty Officer Reports, Montana Groundwater Pollution Control System Permit List (Yellowstone and Carbon Counties), Montana Solid Waste Mailing List, and the Leaking Underground Storage Tank (LUST) List for Montana.

The Montana NPL contains sites that are listed or are proposed for listing on the Federal Superfund NPL. Review of this document revealed that there are currently no Federal Superfund NPL sites in Yellowstone County or Carbon County, Montana. Review of the Montana Non-NPL revealed three Non-NPL sites in Carbon County and 31 sites in Yellowstone County. The Carbon County sites are located near Bridger, Joliet, and Silesia, Montana. The Yellowstone County sites occur predominantly in Billings, with a few sites near Laurel and one near Huntley, Montana. It should be noted that the Conoco Billings Refinery and the Conoco Landfarm are currently on the Montana Non-NPL.

The Carbon and Yellowstone Counties, Montana Duty Officer Reports were reviewed for the years 1987 through 1995. Officers responded to multiple hazardous materials incidents, with the vast majority occurring in and around Billings, Montana. As a result, the likelihood that a potential pipeline route will be negatively affected by a former duty call incident diminishes as the route proceeds away from the Billings, Montana area.

The Montana Groundwater Pollution Control System Permit List was reviewed for Yellowstone and Carbon Counties. Only the Western Sugar Company of Billings, Montana and Billings Generation, Inc., near Warren, Montana currently possess a Montana Groundwater Pollution Control System Permit. It is unlikely that either of these facilities will have a negative impact on a potential pipeline route.

Review of the 1992 Solid Waste Mailing List and recent telephone correspondence with the Montana Department of Health and Environmental Sciences - Solid Waste Division identify two landfills in Yellowstone County and two landfills in Carbon County. The Yellowstone County landfills are both located in Billings, Montana. The Carbon County landfills are located in Bridger and Fromberg, Montana.

Review of the December 1993 LUST List for Montana indicates that there are approximately 150 confirmed sites in the Billings area where LUSTs have been identified. Fourteen sites have been identified in the vicinity of Laurel and four sites were identified in the vicinity of Bridger. No other LUST sites were identified in, or adjacent to, the study area.

4.0 Environmental Consequences

4.1 Socioeconomic Consequences

Impacts to the socioeconomic environment will result from the construction and operation of the proposed Beartooth Pipeline. Many of these impacts can be viewed as beneficial to the local economies within the three affected counties. The direct short-term project impacts are largely associated with project construction, while long-term impacts of pipeline operation would affect future rates of regional oil revenues and taxes. The following discussion of impacts assumes that each of the action alternates have equal, or similar, impacts on the socioeconomic environment.

4.1.1 Population and Housing

Potential impacts of the proposed project on population and housing characteristics are expected to be similar for each of the route alternates. No direct impacts to residential housing units or commercial businesses will occur with any of the route alternates. It is assumed that the preferred alternate will avoid all structures, and that there will be no displacements. Furthermore, where the alignment of the preferred alternate approaches the vicinity of a residence, full consideration will be given to minimizing any perceived impact. Elements of consideration will include maintaining existing route(s) of access, realignment of pipeline route within that particular area, and creative use of existing landscape elements to minimize local alterations to the landscape, thereby minimizing impacts to the local visual structure of the landscape.

A primary impact to the respective populations of Yellowstone, Carbon, and Park Counties is associated with the temporary change in total populations for each during the construction of the pipeline. There will be a direct increase in the local work force while the pipeline is under construction. Consequently, there will be a temporary proportionate increase in the populations of the local communities within the project area. Based upon an estimate of the available work force within the three counties, it is assumed that it may be necessary to import skilled personnel into the area. In total, approximately 136 workers will be required for all phases of pipeline construction. This approximation does not include construction management, survey and X-ray crews, inspectors, or material warehousemen. The employment of non-local workers from other areas directly increases short-term community/county populations. Based upon the proposed Beartooth Pipeline construction schedule, most of these workers will remain within the project area for a period of 2 to 3 months.

Based upon preliminary estimates, it has been determined that the work force required to complete construction will be available, although exact figures of whether the existing work force in the tri-county area can supply all of the necessary labor has yet to be determined. Factors that may impact the need, extent of need, and duration of need for non-local workers depends on the availability of local, appropriately skilled personnel during the period of construction and relative success at maintaining the projected construction schedule.

The installation of the new pipeline will require the addition of permanent full- and/or part-time employees. It is anticipated that the new pipeline will necessitate the addition of two technicians to operate and maintain the pipeline. Salaries paid to new employees will consequently contribute indirectly to the support of local businesses and tax base.

The influx of construction phase non-local employees will increase the demand for temporary housing within the project area. Construction of the pipeline will proceed from the north to the south and will begin in August 1996. The increase in the need for temporary housing due to pipeline construction will parallel the seasonal incursion of tourists to the three-county area. This situation will create a competitive demand for housing. The presence of additional workers within the area will impact the number of rooms available to tourists. Consequently, localized unavailability of rooms may occur as occupancy potential is attained. This may cause travelers and tourists to travel greater distances than anticipated to secure lodging.

4.1.2 Employment and Income

The construction and operation of the proposed pipeline will directly impact the local economy in the form of additional employment opportunities, affect property tax revenue via the collection of ad valorem taxes, elevate earnings-based compensation for local and non-local workers, and increase revenue to local services and retail locations. Each of these effects will largely be short-term as the majority of workers and related compensation will be associated with the construction of the pipeline.

The construction of the facility will require approximately 136 employees over the course of a 2- to 3-month period. It is expected that the local work force will not support this need in total numbers nor entirely provide the specific, skilled occupations required for the phases of pipeline construction. The use of local workers may potentially translate to a short-term reduction in county unemployment rates within the project area. The influx of non-local workers will temporarily increase the three-county labor pool, while the project will increase the total number of jobs available. The overall composition of the local work force will be altered as the need for pipefitters, welders, laborers, operators, and foremen increases.

The byproduct of increased employment to the labor market area will be a direct increase in earnings-based compensation for local and non-local workers. According to preliminary estimates, approximately 136 employees will be required for pipeline and station construction. Again, this figure does not account for material supplier personnel, warehousemen, and survey crews. Work force categories and the representative percentages of the estimated total work force are given in Table 4-1.

The total manhour estimate for facility construction is 58,000 hours and is based upon 10-hour days and 6-day weeks. Labor rates for pipeline construction occupations range from $15.50 per hour for a laborer to $35.00 per hour for a welder. By taking an average of hourly labor rates for six pipeline construction classifications, an average rate will be $22.08 per hour. An estimate of earnings-based compensation arising from the construction of the pipeline facility will be $1,280,640. This figure is anticipated to be larger when benefits and overhead are factored into the total compensation calculations.

Pipe suppliers and contractors and other construction-associated businesses will also potentially realize an increase in the number of jobs, and in compensation and revenue. The "multiplier effect" of higher population numbers, a greater number of jobs/workers, and increased demand for temporary housing will result in additional revenue to local services and retail enterprises (i.e., restaurants, grocery stores, gas stations, hotels/motels).

Other income-related impacts resulting from construction activities involve landowner compensation. Typically, pipelines have been compatible with various land uses such as agricultural, rangeland, industrial, residential, and recreational. Those direct impacts to landowners result from the temporary abandonment of current land uses in those areas where the pipeline will be aligned.

Two forms of compensation exist: (1) payments for ROW easement, and (2) damage or loss payments due to the direct economic consequences of the temporary loss of productivity (i.e., loss of acreage for row cropping). ROW easements are typically one-time payments made to private landowners. Compensation is based upon a price per rod for a 50-foot wide easement. There are variable values calculated for various property classes (i.e., pasture, dry land farmed, irrigated farmland, residential). The length of pipeline through the various property classes ultimately will determine the ROW easement payments to landowners.

In those instances where pipeline facility construction interferes with the economic productivity of a landowner, compensation will be based upon direct damage or loss realized by the landowner. For instance, loss of cropland acreage is considered to be actual damage. Historically, adverse impacts resulting from pipeline construction are short-term, as most property uses can continue after the pipeline is installed.

Ongoing property tax payments of up to $500,000 would begin following the pipeline construction. Because the state of Montana would centrally assess the project's taxable value, pipeline tax payments would accrue to both the local counties (Yellowstone and Carbon Counties in Montana), and other Montana counties having centrally assessed Amoco and Conoco pipelines. As the assessed value of the pipeline would rapidly depreciate (usually over a 10- to 20-year period), project property tax payments would decline until reaching a fully depreciated level.

Increased imports of Canadian oil would be expected to replace and displace Montana and Wyoming oil production. Recent Wyoming oil production has been declining at an approximately 4 percent annual rate, while Montana oil production has been declining at approximately a 2 percent annual rate (see Section 2.6.7 for details). The project's increased oil deliveries would be expected to maintain and accelerate ongoing long-term decline rates in regional oil production, with effects concentrated in the Elk Basin area of Wyoming, thus decreasing tax revenues from regional oil producers.

Long-term benefits to the local socioeconomic environment will be the addition of part-time and/or full-time employment required for the operation and maintenance of the pipeline facility and an increase in county property tax revenues. The operation of the Beartooth Pipeline will create the need for two full-time personnel to assist in pipeline maintenance and operations. Amoco/Conoco will pay ad valorem taxes (proportional to the length of the facility through each county), which will increase property tax revenues for the operational lifetime of the facility. Easements from federal agencies require annual payments for ROW and annual administrative fees for required permits.

Impacts are not expected to occur to existing employment levels at either the Conoco refinery in Billings or the Amoco oil fields in Elk Basin as a direct consequence of the construction and operation of the proposed pipeline facility. There will be no direct loss of employment to part-time or full-time employees.

Agricultural output within the project area will potentially be affected during the construction phase of the pipeline. Rangeland and cropland may be affected within the ROW for the preferred alternate as these areas will be removed from production for a period of 1 year.

4.1.3 Land Ownership

Private land is the primary land ownership category affected by the proposed project (Table 4-2). As presented in Table 4-2, the proposed route affects approximately 665.7 acres of privately owned land, 13.8 acres of state lands, and 6.5 acres of BLM lands.

In comparison with the proposed route, the Billings Boulevard Alternate will affect a reduced acreage of private land and will not affect state lands. However, much of the private land along this realignment is developed residential and may not be desirable from a construction feasibility and scheduling perspective.

Each of the route alternates realignments will cross a slightly greater amount of state and/or federal lands as compared to the proposed route. Potential differences in acreage impact within these lands range from 8 acres of state and federal lands combined, to approximately 21 acres depending on the segment. The Express Alternate, however, results in a slightly lower impact potential to state lands as compared to the proposed route.

4.2 Community Services and Facilities

Pipeline route development and evaluation was, in part, based upon the avoidance of community facility locations. However, impacts to the existing community services and facilities are expected to occur as a consequence of the installation of the pipeline facility. Direct, physical impacts to community services and facilities are not anticipated (i.e., the displacement of a facility). However, long-term payments (30 years) of property taxes and private easement payments may indirectly contribute to the financial support of community services.

Other impacts realized as a result of the construction of the pipeline are anticipated to be short-term. Based upon the assumption that there will be a net immigration of workers and suppliers necessary to complete the construction of the pipeline, there will be a short-term increase in local populations. The addition of people within the three-county area will potentially result in the higher demand for community services and facilities.

The effect of higher demand for services and greater usage of facilities will impose pressure on the project area systems, especially during the height of tourist season (June through August). It is assumed that the increase in local population and use of services and facilities will not result in significant adverse impacts to the respective communities.

4.3 Land Use

Potential environmental impacts to project area land uses are summarized in Table 4-3, and are expected to be primarily limited to the construction phase of the pipeline development. Potential impacts will result from the clearing of the entire construction ROW for the installation of the pipeline and from the maintenance of a permanent ROW. However, because most of the proposed route is either rangeland or cropland, no significant long-term impacts are anticipated.

In most cases, the vegetation on the temporary ROW will be brush beat, thereby preserving the root systems along the temporary ROW. After construction, the permanent and temporary ROWs will be restored to pre-construction conditions. Once restored to pre-construction condition, large shrubs or structures, will not be permitted on the permanent ROW; however, most agricultural practices will be allowed.

The use of standard construction procedures, soil and erosion control, and elevation of disturbed areas should reduce the potential for long-term impacts to the local environment. Long-term impacts associated with the pipeline operation include the land easement encumbrance for the permanent ROW and its restrictions. The easement encumbrance will prohibit certain types of continued residential use such as the construction of structures in the ROW. In addition, the necessary inspection and maintenance activities may be viewed as a temporary inconvenience by some landowners.

The pipeline owners would acquire the right to construct and operate the pipeline across federal, state, and privately owned lands. The pipeline easement, usually negotiated with the landowner, is the instrument used to convey ROW to the pipeline company. The easement gives the company the right to operate and maintain the pipeline and the permanent ROW and, in return, compensates the landowner for the use of the land. The easement negotiations between the pipeline companies and the landowner would include compensation for loss of use during construction, loss of nonrenewable or other resources, and the restoration of unavoidable damage to property during construction.

If an easement cannot be negotiated with the landowner, the pipeline owners may use the right of eminent domain granted to them under Montana and Wyoming state law. The companies would still be required to compensate the landowner for the ROW, as well as for any damages incurred during construction; however, the level of compensation would be determined by the court according to state laws. State laws have established procedures for the use of eminent domain. Generally, the pipeline company would file in either state or federal court for the right to use land by eminent domain. The level of compensation determined as a result of condemnation proceedings could be different than the amount of money offered during earlier negotiations with the company.

At the time this EA was prepared, the pipeline owners had acquired landowner approval for pipeline construction on 69 of the 78 privately-owned tracts along the companies' proposed route. Consultation regarding acquisition of the remaining privately-owned tracts is ongoing between the project sponsor and the landowners. Easements on state and federal lands are pending finalization of this EA and application procedures for the easements.

4.3.1 Developed

Potential environmental impacts to all developed land use areas is limited due to the current conditions and uses of the area. Potential impacts to existing vegetation and surface water features (i.e., irrigation canals or ditches) will be limited to the construction of the pipeline. Potential impacts to humans will be both short- and long-term. The impact in both cases will primarily be restricted to an inconvenience to normal human activity when construction or maintenance personnel are working within the pipeline corridor. The utilization of proper construction techniques, and the regrading and revegetating the ROW will minimize long-term impacts.

Construction near residential areas will result in temporary impacts to local residents. Potential impacts include ground disturbance and the removal of trees and other landscaping (should they occur in isolated areas), inconvenience from construction noise and dust, and damage to existing septic systems or wells. Because of a greater amount of recreational land use in the vicinity of Billings and Billings Boulevard, the Billings Boulevard Alternate will cross a greater amount of residential land use (approximately 3.4 acres) as compared to the proposed route.

4.3.2 Agricultural

Potential environmental impacts to each of the land types classified as agricultural are similar in type between each of the route alternatives, but differ in the amount of area potentially affected. Agricultural lands represent the second most affected land use type, with disturbances expected to be approximately 132.6 acres for the proposed route. Approximately 36.9 acres of irrigated land (primarily in the vicinity of Metzger Road) will be affected by the proposed route. Although irrigated land uses occur in the vicinity of Bowler (see Figure 3-2), no irrigated lands are crossed by the proposed route. Impacts to agricultural land uses with each of the route alternates are greater than that for corresponding segments of the proposed route (see Table 4-3). However, the Bluewater Creek Alternate will not cross irrigated cropland. Potential environmental impacts to all agricultural land will be limited to the construction phase of the pipeline development. While physical disturbance to the corridor will be short, the disturbance could be enough to remove impacted areas from agricultural production for one growing season. The use of standard construction procedures, soil and erosion control, and revegetating disturbed areas should eliminate the potential for impacts to productivity; however, hay and pastures may take approximately 2 years to return to pre-construction production levels (personal communication, NRCS, 1996). Special precautions will be taken to avoid introducing noxious weed species in those areas disturbed during the construction of the pipeline as this may affect future agricultural productivity. Measures to be used to prevent the introduction of noxious weeds include applying herbicide prior to beginning construction, revegetating with a weed-free seed mix, herbicide application after revegetated grasses have reached the six to eight leaf stage, followup spot application for 2 years, and spray washing all equipment operated in a weed infested area and when traveling from one county to another.

4.3.3 Rangeland

Rangeland is the most affected land use category of any land use type (see Table 4-3). Potential impacts to rangeland between the proposed route segments and the Blue Creek, Bluewater Creek, and Polecat Bench Alternate route segments are generally similar in magnitude (i.e., within 5 to 10 acres). However, the Billings Boulevard and Express Alternate route segments each result in a reduced acreage impact to this land use type (60 and 30 acres, respectively) as compared to the proposed route near those areas (see Table 4-3).

Potential environmental impacts to all rangeland land use areas are identical in type between each of the alternates, but differ in the area potentially affected (see Table 4-2). Potential impacts to all rangeland will be limited to the construction phase of the pipeline development. Physical disturbance to the corridor will be similar to what occurs in the agricultural land use. While the short-term impact to rangeland will be the physical disruption of the corridor, long-term impact will be limited to changes in vegetative cover in the corridor. Revegetation in grasses will eliminate any woody species currently present in the corridor. Potential impacts to human activities within rangeland will be limited to the loss of access to the ROW during construction activities. However, there should be no long-term impacts to the human activities that currently occur within this land use. Areas disturbed by construction activities will be reseeded with a variety of native grasses in order to deter the establishment of noxious weeds.

As discussed in Section 3.4.3, a portion of the rangeland south of the Bowler Flats and with northern Wyoming may be characterized as desert shrubland. Potential impacts to desert shrubland cover type include habitat alteration and direct loss. Numerous wildlife species utilize the vegetation in the desert shrubland for food and shelter. Mule deer use the shrubs to protect their young from winter winds, protective cover from predators, and as a food source during winter months (The Field Guide to Wildlife Habitats of the Western United States, Benyus, 1989). Sage grouse and numerous other species acquire food and shelter from the vegetation year round. Estimated impacts to this cover type are 135.6 acres for the proposed route and 145.1 acres for the Polecat Bench Alternate.

4.3.4 Forestland

Forestland potentially affected by the proposed route occurs in the north along Bender Road and in the south, northwest of Bowler. Approximate acreage impacts to this land use type along the proposed route are estimated to be 2.3 and 5.6 acres, respectively. By comparison, the Billings Boulevard Alternate will result in slightly greater impacts to forestland (5.3 acres), whereas the Express Alternate will reduce impact (3.7 acres).

Potential impacts to forestland will be both short- and long-term. Short-term impacts will be restricted to the construction phase of the pipeline, as discussed in Section 4.2. Long-term impacts will be to the vegetative structure of the corridor. Woody vegetation will be removed from the corridor. It is anticipated that reestablishment of woody species will not occur upon the completion of construction activities. While the loss of dominant woody vegetation in the corridor will occur, no significant impact to forest productivity or overall forestland use is anticipated with the proposed route as most of the forestland affected is along the edges of forested parcels and comprise only a minor acreage. In contrast, the Express Alternate, while affecting only a small acreage (3.7 acres), dissects a forested parcel north of Bowler which may have indirect effects on general forestland productivity (i.e., faunal movement).

4.3.5 Open Space/Recreation

Impacts to parkland or recreational resources are expected to be minimal for the proposed route. The Billings Boulevard Alternate, if selected, could potentially impact Riverfront Park to the south of Billings. Any construction activities occurring within the park boundaries will be short-term in duration. Correspondence with the City Parks and Recreation Department will occur at the outset of the construction phase of the project. Consequently, potential impacts to the park may be limited to its short-term unavailability to park users during the construction phase. However, construction staging areas at the entrance and exit locations of the directional drilling may also impact local land uses and vegetation types. There are no other recreational land uses crossed by any routes.

Potential mitigative measures to offset anticipated impacts to the park may include the use of creative landscaping to minimize local alterations in the landscape, and realignment of the pipeline.

4.4 Transportation

As presented in Section 3.5, roadways, railway, and air transport constitute the three major transportation system components within the study area. Of the three, construction of the proposed pipeline segments will likely have the greatest impact on the roadway infrastructure. Table 4-4 identifies the number of roads, railroads, and pipelines crossed by each route alternate. However, Table B-1 presents a detailed listing of each road crossing. During the construction period, project related traffic will likely not be noticeably impacted on I-90 or State Highways

295 and 310 as these roads will be crossed by drilling. However, trenching may be used to cross improved gravel roads, improved graded roads, and unimproved dirt roads within the project area and detours or localized traffic delays will likely be experienced. Effects to secondary roadways may include increased traffic during typical ingress and egress periods, an increase in dust and noise generation as a result of increased traffic, damage or rutting of paved surfaces due to heavy equipment transport, and rutting and/or general degradation of unpaved surfaces due to repeated use during wet conditions.

While impacts such as increased traffic frequency and dust and noise generation are short-term effects which will only occur during the construction period, roadway damage may not be considered a short-term impact. Effort should be made by materials transport and construction crews to minimize impacts to roadways by construction equipment. Where project related damage or degradation occurs, roadways should be repaired to match pre-construction conditions.

Amoco/Conoco are required to submit Environmental Checklists for the following crossings: Interstate 90, Primary Route 310, Secondary Route 416, and Secondary Route 429.

4.5 Air Quality

The ambient air quality in the immediate vicinity of the project corridor may be reduced temporarily due to the increase in particulates (dust) and hydrocarbon combustion by-products resulting from the operation of construction equipment. However, negative impacts to the ambient air quality due to construction activities associated with the pipeline installation are expected to be minimal due to the relatively short duration of the construction period and are not expected to have an impact on overall regional air quality.

4.6 Noise

Potential noise impacts of each of the route alternates are similar. These potential noise effects are primarily associated with activities that will take place during the construction phase. Most of the project site is remote and contains few sensitive noise receptors (i.e., churches, schools, residences, etc.). In general, large distances separate the areas of proposed activity from existing residences. Consequently, no significant noise impacts to adjacent properties are anticipated with any project alternate. In the vicinity of Billings, however, a greater number of residences are located in close proximity to the proposed route, and will, therefore, be exposed to temporarily higher noise levels during the construction phase. By comparison, potential noise impacts are expected to be greater with the Billings Boulevard Alternate due to its close proximity to a greater number of residences. The only potential on-site noise impacts associated with each of the project alternatives are to site workers as a result of the operation of construction equipment.

Potential construction phase impacts include those related to noise generated from mechanized equipment (e.g., loaders, bulldozers, cranes, trucks, etc.). Noise emissions during the construction phase of each alternate are likely to vary depending on the type and number of construction equipment utilized at a given time and location. However, it is expected that the noise emission levels of all mechanized equipment utilized during the construction process for each project alternative will be within the General Services Administration construction noise specifications. A listing of these specifications is provided below for some types of the general construction equipment likely to be utilized during the construction phase of each alternative.

Equipment Type	Noise Level (dBA)
Backhoes	85
Dozers	80
Scrapers	88
Graders	85
Trucks	91
Cranes	83
Pumps	76
Generators	78
Compressors	81

Noise attenuation from the source will occur, and is dependent on such factors as terrain, wind speed, and the composition of the land surface (i.e., soft or hard surface).

4.7 Visual Resources

To a large degree, the potential for impact of each of the alternate routes on visual quality of the project area is related to the sensitivity of the visual resource, the timing and duration of construction activities, the nature of existing vegetative cover, and the extent to which the construction site will be regraded and vegetated. In addition, distance of the proposed pipeline on new alignment, the type of vegetative cover, slope and soil reclamation potential also relate to visual resource sensitivity issues.

Visual impacts which may occur with each of the proposed routes include those attributable to the presence of the construction spread on the landscape, the clearing of trees within the proposed ROW, the construction of access roads servicing the proposed ROW, and grading of the ROW. In the absence of mitigative measures, construction activities can result in several adverse impacts. For example, short-term impacts include the visual presence of the construction spread, and cleared vegetation and landscape scarring, whereas long-term impacts may include eroded

ROW, undesirable viewsheds (e.g., long, cleared corridor within forested areas), and scarring of stream banks and channels, and native grasslands.

Because of the manner in which the Yellowstone River is proposed to be crossed (i.e., directional drilling), none of the alternate routes are expected to have an adverse long-term affect on the visual character of the river corridor. However, during the construction phase, scenic views may be impacted by the presence of construction crews.

Routes that generally follow existing roadway and pipeline corridors may be expected to have a reduced level of long-term impact on the visual resource of the project area. This is primarily attributable to the reduced degree of land clearing, grading and scarring that will occur in areas currently lacking developed corridors. As presented in Table 4-5, the Billings Boulevard, Blue Creek, Express and Polecat Bench alternates consequently represent a lower potential for impact to the visual resource as compared to other route alternates. Similarly, each of the proposed route alternates represent a slightly reduced potential impact to the landscape as they encounter agricultural lands to a greater extent (see Table 4-3).

Mitigative measures that may be used to offset long-term visual impacts include the proper regrading of the ROW, strict adherence to erosion control measures, creative landscaping in developed areas, regrading of stream banks, selective planting of woody species in certain areas (e.g., along stream channels and protected areas), and seeding or drilling of native grasses and forbs in rangeland areas.

4.8 Soils and Geology

4.8.1 Geology

Impacts to geological formations, outcrops, and sandstone cliffs are not expected to occur as a result of the construction of the Beartooth Pipeline. Although excavation procedures may cause minor local changes to existing geological characteristics, they are not expected to be significant. It is important to note that the mapping of landslide deposits and geologically unstable areas was available for only a part of the northern portion of the study area. Generally, slope stability for the northern three-quarters of the study area has not been completed. Ultimately, the route selected for the Beartooth Pipeline should be surveyed for the presence of geologically unstable areas which could potentially compromise the integrity of the pipeline. The routing of the pipeline should be shifted in order to avoid unstable areas.

4.8.2 Soils

Soils in the immediate vicinity of the project area will be impacted to varying degrees during pipeline construction and operation/maintenance activities (Table 4-6). These impacts include horizon mixing, soil compaction, and increased potential for soil erosion. In addition, certain soils may have characteristics that may affect the ability to reclaim the disturbed soils along the ROW.

In general, potential impacts during construction are expected to be greater than impacts during operation and maintenance of the proposed pipeline. During construction, clearing of vegetation exposes the soil to the erosive forces of water and wind. While many of the soils in the project area are relatively well drained, the potential for erosion will be somewhat greater in reaches of the project area where the topography provides for steeper slopes.

Another potential construction-related impact is inversion of the soil horizon. Excavation of soil followed by backfilling typically does not provide for the re-establishment of the natural, pre-construction soil profile, thus reducing post-construction fertility. Topsoil within cultivated and improved areas will be separated and stockpiled, and will remain segregated until after pipeline installation procedures. Following pipeline installation, topsoil will be placed over subsoil in order to, as closely as possible, recreate preconstruction soil horizon characteristics. Following pipeline installation, fertility of the disturbed soils will be promoted through application of applicable fertilizers and plantings. In areas where soil conditions warrant, provisions will be made to remove and stockpile topsoil for final application after initial backfilling. As a mitigative measure, soils will be salvaged in designated areas (which may include either the trench or the entire ROW) to enhance reclamation. For instance, topsoil should be salvaged and segregated from subsoil within rangeland areas as well. At a minimum, this should occur on state and federal lands and on acreages where the landowners are participating in the Conservation Reserve Program. A plan identifying salvage areas, potential reclamation procedures, and mitigation measures will be prepared in advance of any construction activities.

Soil compaction and rutting will occur during construction activities as a result of heavy vehicular traffic. These effects may be most severe during, and immediately following, precipitation events and in areas with very shallow groundwater. Further rutting and compaction may result from off-road vehicle use during pipeline operation and maintenance activities. However, these impacts will be minimized where the route utilizes existing ROWs.

At the completion of pipeline installation activities, various measures will be employed to reduce or eliminate short-term and long-term effects on soils. Measures utilized may include final re-grading, mulching, fertilizing, and selection and planting well adapted vegetation or seed mixes.

4.8.3 Soils with Potential Reclamation Problems

Table 4-7 summarizes the results of a semi-quantitative analysis of soils that may require directed mitigation measures because of potential reclamation problems that may arise from soil disturbance within the construction ROW. The length of potentially problematic soils within each alternate route segment was measured for comparison purposes. Affected acreage was determined using linear lengths through potentially problematic soils multiplying by the construction ROW width of 80 feet (permanent ROW width is 50 feet). As discussed in Section 3.9.4.4, the results represent a coarse analysis.

As presented in Table 4-7, there is no significant difference in amount of potentially problematic soils affected between alternate routes A_1 and A_2, or between the west and east Bluewater Segments (D_1). However, the analysis indicates that Alternatives B_1 (west) and D_2 (east) may be preferred over routes B_2 (east) and D_1 (west). At the southern end of the pipeline, the analysis indicates that route F_1 may be more amenable to suitable reclamation relative to route F_2.

4.9 Water Quality and Aquatic Ecology

4.9.1 Surface Water Quality and Hydrology

In general, the greater number of streams crossed by a given route results in a correspondingly greater potential for short-term construction-related impacts as well as long-term operational impacts. Construction of the pipeline along the proposed route will involve the crossing of 8 perennial streams and 54 intermittent streams (Table 4-8 and Appendix Table B-2). In some cases, these stream crossings will be located at previous ROW crossings (e.g., roadways, transmission lines, pipelines, etc.) thus minimizing effects to previously undisturbed resources.

Each route alternate has the potential to impact a number of surface water resources (see Table 4-8). The Billings Boulevard Alternate (Segment A_2) will require six stream crossings, whereas the proposed route intersects a total of 10 surface water resources. The Blue Creek Alternate (Segment B_2) will also require fewer stream crossings relative to the proposed route (three versus nine), and will cross exclusively intermittent streams, whereas the proposed route will cross one perennial stream. The Express and Bluewater Creek Alternates were developed as alternatives that could reduce potential impacts to the Bluewater Fish Hatchery and provide greater consistency with existing land uses. Because of its greater distance from the Bluewater Fish Hatchery, the Express Alternate exhibits a reduced level for potential impacts to Bluewater Creek and the fish hatchery. The Bluewater Creek Alternate results in fewer crossings of Bluewater Creek (1 versus 3), and one less intermittent stream crossing (4 versus 5). In contrast, the Express Alternate results in a greater number of stream crossings as compared to the proposed route (3 perennial and 24 intermittent versus 2 perennial and 13 intermittent). The Polecat Bench Alternate, located south of Bowler, integrates Segment F_2 and results in a similar number of stream crossings as compared to the proposed route (18 versus 17, respectively).

Short-term impacts will occur at most stream crossings. Trenching, which involves excavation of stream banks and bottoms, will result in temporary alterations in hydrology and elevated levels of suspended solids in flowing streams causing downstream siltation and sedimentation. Depending on the extent of siltation, the effects may then result in mortality of benthic and planktivorous invertebrates and degradation of fish habitat. In most cases, crossings will be completed in a single operation, reducing the elapsed time of disturbance and reducing impacts.

The crossing of the Yellowstone River by the proposed route and the Billings Boulevard Alternate is not expected to result in impacts to water quality during either the construction or operational phases of the project. Installing the pipeline beneath the river via directional drilling avoids physical contact with the river channel and the river banks, thereby minimizing potential impacts to water quality. The presence of a hard blue shale beneath the riverbed supports the feasibility of directional drilling as a means of crossing the Yellowstone River.

In those areas where the trenching of stream channel is to occur, stream recovery from short-term impacts should occur rapidly. Trenches will be backfilled with non-erodible material (such as cobble to boulder sized riprap). Stream width and depth will be restored to pre-construction conditions, thus minimizing alterations to stream hydrology and enhancing recovery of benthic invertebrate communities. Recovery of these communities has been shown to be rapid in responding to similar stream disturbances (Chisholm and Downs, 1978; Barton, 1977; Reed, 1977). The extent of potential impacts associated with the trenching of stream channels is logically related to the state of water flow at the time the stream crossing is being constructed. As most of the creeks and streams in the area are ephemeral or intermittent, it may be likely that many stream crossings will exhibit little, or no, water flow. The opportunity for increased siltation, downstream sedimentation, and bank erosion obviously increases with the presence of flowing water. The dry crossings should have the potential to produce fewer impacts to instream and downstream water quality. Care should still be exercised to maintain in-channel and bank morphometry and substrate continuity.

A potential impact in agricultural areas consists of damage to irrigation ditches or channels. Efforts will be made to limit impacts to existing irrigation corridors, and provisions will be included to repair or modify irrigation ditches or channels damaged during construction.

Increases in sedimentation and turbidity can have adverse affects on aquatic primary production, feeding, reproductive success, upstream migration, and spawning in certain species. However, because most stream crossings are likely to be dry during the construction period (August), potential impacts from turbidity and sedimentation are expected to be minimal. Since most of the streams occur in areas with moderate gradients, erosion and sediment control measures will be instituted to ensure that impacts are minimized. All stream crossings should be properly planned prior to excavation in order to reduce delays and impacts associated with the delays. Generally, stream crossings should take no more than 1 or 2 days. However, if blasting of rock in the stream bed is required, the construction schedule could be affected.

The impact of pipeline construction for each of the alternates on hydrology and surface water quality is primarily associated with the number of stream crossings. Each of the various surface water resources that may be affected are presented for each segment in Appendix Table B-2.

Potential impacts associated with the operational phase of the project are associated with the increased potential for surface water and groundwater contamination should an accidental release of oil occur. Such a release, depending on its location, may affect water quality and aquatic organisms of streams such as Bluewater Creek, Blue Creek, Sage Creek, and Meir tributaries, as well as the Yellowstone and Clarks Fork Rivers. In the event of such a release, drinking water supplies as well as water used for irrigation and the Bluewater Fish Hatchery may also be affected. As discussed previously in this section, routes crossing a greater number of streams have a proportionately greater potential for impacts to surface water resources. However, strict adherence to proper construction specification, extensive preoperational testing, and regular inspection of the pipeline will minimize the potential for an accidental release. The installation of the pipeline within a hard blue shale bedrock in crossing the Yellowstone River will prevent discharge of oil to the surface water should a rupture in the pipeline occur. Additionally, other devices to further minimize any potential for a release will include an automated block valve on the north bank and a manual block valve and check valve on the south bank. Due to the positive head downstream of the river crossing, the check valve will close if upstream pressure is lost.

4.9.2 Groundwater Resources

Significant effects to groundwater quality resulting from construction activities and normal operation and maintenance of the pipeline are not expected. However, very shallow groundwater may be locally impacted by grading, grubbing, excavation, and compaction activities both during and after pipeline installation. Any alteration of shallow groundwater levels during construction (resulting from de-watering activities) is not expected to be detrimental, and post-construction alterations of shallow groundwater levels are not expected to be significant. However, shallow groundwater flow paths may be affected during and after pipeline installation.

Removal of vegetation may reduce evapotranspiration which may increase recharge to the groundwater system. However, soil compaction within the construction ROW due to heavy equipment traffic may locally reduce rainwater infiltration and groundwater recharge. Grading activities may temporarily affect surface runoff drainage patterns and create locations where surface runoff is retained. These retention areas could locally increase groundwater recharge, particularly in areas underlain by relatively permeable material. However, attempts should be made to minimize or eliminate any long-term modifications to natural surface water drainage patterns. As discussed in Section 4.9.1, the installation of a new pipeline in an area in which a pipeline does not presently exist, results in a greater potential for contamination of groundwater, should a release occur. However, strict adherence to required construction specifications coupled with extensive preoperational testing and periodic inspection will minimize the potential for an accidental release.

4.9.3 Floodplain

Potential floodplain impacts associated with each of the route segments are presented in Table 4-9. In designated floodplains, in accordance with state and local requirements, the pipeline will be buried at depth that is two times the scour depth.

Pipeline route segments which will traverse areas designated as 100-year floodplains include Segments A_1, A_2, B_1, C, D_1, D_2, and E. The linear length (in feet) of floodplain utilized by these route segments are approximately 2,200, 4,200, 550, 400, 1,300, 200, and 800, respectively (see Table 4-9). A more detailed length analysis indicates that Segment A_1 crosses approximately 200 feet of floodplain associated with Blue Creek. The estimate for Segment A_1 assumes that directional drilling will be applied to install the pipeline beneath the Yellowstone River and its associated 100-year floodplain. Segment A_2 would utilize approximately 4,200 feet of Yellowstone River floodplain. This estimate assumes that the pipeline will be attached to the Billings Boulevard Bridge for a distance of approximately 1,000 feet. Segment B_1 will utilize approximately 350 feet in crossing the East Fork of Duck Creek, and approximately 200 feet of 100-year floodplain crossing Duck Creek. Segment C will utilize about 200 feet of floodplain crossing Cottonwood Creek (north of Edgar, Montana) and approximately 200 feet in traversing the North Fork of Five Mile Creek. Segments D_1 D_2, and E will traverse approximately 1,300, 200, and 800 feet, respectively, in traversing Sage Creek. In comparison to the proposed route, the Billings Boulevard Alternate would cross floodplains for an additional 2,000 feet; the Blue Creek Alternate would avoid floodplains entirely; and the Express Alternate would reduce the needed floodplain encroachment by approximately 1,000 feet.

FIRM mapping is not currently available for Park County, Wyoming. As a result, topographic maps and adjacent Carbon County, Montana FIRMs were used to estimate floodplain location and extent. Based on the review of available information, it appears unlikely that either of the pipeline segments through Park County (Segments F_1 and F_2) will traverse a 100-year floodplain.

4.9.4 Aquatic Ecology

Impacts to aquatic biota may occur during the construction phase as a result of siltation/ sedimentation, pollutant loading, and habitat alteration. Each one of these potential mechanisms varies in degree from site to site and may result in both short-term and long-term impacts depending on the nature of the impact.

Siltation and sedimentation are often short-term and usually occur most often with the construction phase. Weather during the construction phase can be a factor in determining the extent to which erosion and siltation/sedimentation will impact adjacent surface water resources. Construction of any kind almost inevitably results in some erosion, and even small amounts of mineral matter may cause changes in the fauna (Hynes, 1976).

Pollutant loading may also occur through the use of heavy machinery such as tracked backhoes and other construction vehicles. Impacts could be caused by leaking fuel, hydraulic fluid, grease, or oil spills. These impacts are short-term and can be reduced with good preventive measures.

The installation of a new crude oil pipeline across a surface water system also represents a potential for release to the environment where one previously did not exist or an added risk if located along a pre-existing pipeline. Operational pipeline spills can have large impacts on the environment. Studies indicate that habitat and fauna restoration to preconstruction communities can occur over long periods of time. As discussed in Section 4.15, however, pipelines represent one of the safest modes of transporting oil and other products across the country. Consequently, the potential for such a release is expected to be relatively low. In addition, proper preventive practices and good response plans can help to decrease potential impacts if an oil spill occurs.

Habitat alterations may also affect surface water resources. Riparian vegetation acts as a natural filter to lessen sedimentation caused by erosion. Removal of streamside vegetation may result in long-term increases in siltation that could result in a decline of a more preferred fish or macroinvertebrate fauna, and an increase in less desirable organisms.

Some potential effects on the aquatic communities may come in the form of avoidance. The composition of the local fish population may temporarily shift from one dominated by intolerant fish to more tolerant species (from trout to suckers). Similarly, the benthic macroinvertebrate community may also change its composition. Less tolerant insects (Ephemeroptera and Trichoptera) may disperse downstream and may be replaced by more tolerant taxa (Oligocheates and Chironomids). However, this shift in composition may be only temporary, if habitat and water quality conditions return to preconstruction levels. Recovery of aquatic insect communities from alterations resulting from watershed disturbances appears to be directly related to the recovery rates of terrestrial vegetation. The type of stream crossing may also determine the amount of impact that the resource receives. Pipeline construction involving existing bridge crossings introduce less habitat alteration and thus reduce the degree of impact potential.

Mitigative measures have been developed to reduce the effects of construction on surface water resources, including the strict adherence to erosion and sedimentation control plans. The seasonal timing of construction can also be important for reducing the impacts to the surface water resources. Construction in the dry season reduces sedimentation during stream trenching and decreases the chance for storms which will help keep the runoff and sedimentation to a minimum. Minimizing the construction activities in the area of the streams can help to reduce the impacts to the water resource.

The wet crossing technique described in Section 2.0 is the proposed technique for flowing streams. All dry streams will be crossed using the open trench method.

4.10 Terrestrial Ecology

The development of study alternates was based, in part, on the avoidance and minimization of direct impacts and disruption of ecological resources. The discussion below addresses the potential impacts of each of the study alternates to terrestrial communities.

4.10.1 Vegetation Communities

Potential impacts to terrestrial communities is associated with the amount of each cover type affected. Impacts to each of the cover types within the project corridor are presented for each of the land use types as land use categories generally reflect vegetative cover types (Section 4.3).

4.10.2 Wetlands/Riparian

The primary impact to riparian and wetland areas may be both short-term and long-term in nature. The extent of potential temporary impacts to riparian or wetland areas is dependent upon the type of construction method used to construct the pipeline. No impacts other than vegetation removal will occur in those areas where directional drilling is used to construct the pipeline. The greatest degree of impact will occur when this land type is ditched for placement of the pipeline. Impacts created during ditching could be reduced in several ways including timing construction to coincide with periods of low flow or during the dry season, using soft tire construction vehicles, and the proper installation and maintenance of erosion and sediment control structures. Pipeline construction will not significantly alter wetland or riparian areas since no areas are planned to be filled or drained. Therefore, no losses of wetlands is expected to occur. All construction methods used will be in accordance with the specifications of the Section 404 permits issued by the USACE. Wetlands located along the alternates were identified through the review of soil surveys and a field reconnaissance of land uses along the corridors. Based upon a ROW width of 80 feet, approximately 0.27 acres of riparian/wetland habitats will be affected by the proposed route (Table 4-10 and Appendix Table B-3). The greatest potential effects to riparian/wetland habitats are associated with the areas along the Yellowstone River and other tributary streams. In contrast, the Billings Boulevard Alternate will result in greater impacts to this habitat type (0.9 acres) as compared to the proposed route due to its greater impact to riparian areas along the Yellowstone River (see Table 4-10). However, with the exception of the Polecat Bench Alternate, other route alternates result in a slightly reduced impact to wetland and riparian areas (typically less than 0.05 acres).

The potential long-term impacts will largely be confined to the change in vegetation structure. Following placement of the pipeline, the impacted area will be revegetated with grasses. Follow-up maintenance for the ROW will preclude any woody vegetation from invading the area. Woody vegetation is a small component of the vegetation present in the wetland observed along the alternate corridors and is primarily represented by the riparian areas along the Yellowstone River, which accounts for less than 1 acre. Other potential long-term impacts may include a localized alteration in stream or wetland hydroperiod if crossings are left in an unreclaimed condition. Restoration of the ROW to pre-construction grade and revegetation will reduce impacts. Disruption of impermeable subsoils in some areas during construction activities may also affect wetland hydrology on a localized basis by effectively allowing water to move into more permeable subsoils.

4.10.3 Noxious Weeds

Noxious weeds are a potential impact to vegetation along the alternate corridors. Construction of the pipeline has the potential to transport, establish, or expand populations of noxious weeds. Montana and Wyoming have laws stating that it is unlawful to allow noxious weeds to propagate or go to seed. Without a stringent plan to prevent the establishment and/or transportation of noxious weeds, potential exists for significant impact since noxious weeds rapidly invade disturbed sites and out compete native species. During construction activities, contractors will comply with the county noxious weed regulations in Yellowstone and Carbon Counties, Montana, and with the Wyoming Weed and Pest Control Act of 1973.

Measures to be used to prevent the introduction of noxious weeds include applying herbicide prior to beginning construction, revegetating with a weed-free seed mix, herbicide application after revegetated grasses have reached the six to eight leaf stage, follow-up spot application for 2 years, and spray washing all equipment operated in a weed infested area and when traveling from one county to another.

4.10.4 Wildlife

Potential impacts to wildlife resources within the study area for each of the alternates are primarily attributable to habitat loss and modification during the construction phase. Barriers placed during the construction of the pipeline will interrupt wildlife mobility and reduce habitat and food supply. Pipeline trenches will be constructed in 2-mile sections and only one section at a time will have open trenches and exposed pipeline.

Numerous leks for sage grouse and sharp-tailed grouse are located in the southern portion of the corridor. Distances to the leks vary greatly. Construction activities should not occur within 2 miles of the leks between March and the end of April (MDFWP, 1996) in order to minimize impacts to the grouse. The Polecat Bench Alternate (F_2) will intersect one lek near the Montana and Wyoming border. Numerous other leks occur less than 2,000 feet from Segments F_1 and F_2 (Table 4-11). Because construction will not occur prior to mid-July, and will be completed by January 1997, no significant impacts to grouse breeding activity is expected to occur with either the proposed route or any route alternate.

Mule deer and pronghorn antelope also occupy several areas during the winter months (November through April). The Express Alternate is the only segment which directly impacts the winter range for mule deer (length through, 3 miles). The majority of vegetation utilized by deer and antelope consists of grasslands and sagebrush stands (Rosgaard, Statewide Mule Deer Ecology Studies, 1981). Potential impacts could occur during the construction phase by reducing mobility and food sources. However, because of the relatively small area of disturbance as compared to the area of available winter range, no significant loss of winter forage is expected to occur with any route alternate. Similarly, both the proposed route and the Polecat Bench Alternate also impact a documented pronghorn antelope winter range area south of Bowler (see Figure 3-5). Lengths through this area are estimated to be approximately 7 miles for the proposed route and 6.25 miles for the Polecat Bench Alternate.

4.11 Threatened, Endangered, and Sensitive Species

The black-tailed prairie dog (state special concern) and white-tailed prairie dog (state special concern) may potentially be impacted by project activities. Several prairie dog towns are located within the project area south of Bluewater Fish Hatchery (see Figure 3-5). As proposed, the Express (D_2) and Polecat Bench (F_2) Alternates will intersect black-tailed prairie dog towns. Lengths through these communities for Segments D_2 and F_2 are 0.4 miles and 0.7 miles, respectively (Table 4-12). Therefore, the Express Alternate and the Polecat Bench Alternate will have the greatest potential impacts to prairie dog towns. The remaining routes are located between 0.2 to 3.4 miles distant from the other prairie dog town sites. Potential impacts include habitat disruption, fragmentation, and food source reduction. The prairie dog towns consist of a complex of tunnels and burrows within grassland prairies and can support numerous other wildlife species. Disruption of the towns may fragment the community and interrupt social interaction. In addition, construction through a town may potentially impact burrowing owls (federal candidate) which utilize vacant burrows as homes and prey on small animals living in grassland areas. The mountain plover may also be affected if nesting occurs in the vicinity of prairie dog burrows. Both the burrowing owl and mountain plover are listed as potentially occurring in Montana. Mitigative measures will include the avoidance of prairie dog towns in order to minimize impacts to the burrowing owl, mountain plover, and prairie dogs. Construction will begin during a period when the burrowing owl and mountain plover are nesting and rearing fledglings. Minor shifts in alignment can be made to avoid documented plover nests and owl burrows.

The black-footed ferret typically inhabits prairie dog towns. This federally listed species feeds on small rodents, birds, and eggs which are normally associated with prairie dog towns; however, its main source of nutrition is the prairie dog. The historic range of the black-footed ferret included a vast expanse of territory within the Great Plains from Alberta, Canada to Texas. Widespread disappearance occurred within the early part of this century to the point that ferrets were thought to be extinct in early 1960. Then, in 1964, a small population was discovered in South Dakota. The black-footed ferret again disappeared from the wild in 1973 and by 1979 the last black-footed ferret in captivity had died, leading to the presumption that the ferret species had not survived. However, in 1981, another small population (nine ferrets) was found near Meeteetse in north-western Wyoming (Cohn, 1991). Later, other isolated colonies were discovered. The reduction in prairie dog towns from poisoning, disease, and habitat elimination has simultaneously reduced the ferret population. Although reintroduction sites are not within the project corridor, a ferret survey may be required in locales where the proposed alignment disrupts prairie dog towns (Davis, 1996, USFWS personal communication). If pipeline routing does intersect a prairie dog town, the Beartooth Pipeline will contact USFWS. The information made available to USFWS should include the location of the area of potential impact, the size of the affected prairie dog town, and the number and size of any other prairie dog towns within a 4.34 mile (7 kilometers) radius. The latter information will act as variables in determining the need for surveys for the black-footed ferret. Should ferret populations be identified as a result of the survey, the USFWS will be contacted prior to construction. In such areas, a shifting of the alignment may be required to avoid these areas.

The short-horned lizard (federal candidate), sagebrush lizard (federal candidate), dwarf shrew (state special concern), Merriam's shrew (state special concern), and Preble's shrew (federal candidate) also use grasslands for foraging and shelter. Temporary habitat losses and alterations of suitable habitat are potential impacts to these species. However, no known locations of these species will be affected by either the proposed route or any route alternate.

There are only minor forested habitat crossings by the proposed route and the alternate route segments (see Table 4-3). However, fragmentation and loss of woodland habitats could affect the foraging of numerous bat species within the project corridor. Those species potentially affected include fringed myotis (federal candidate), spotted bat (federal candidate), Townsend's big-eared bat (federal candidate), small-footed myotis (state special concern), long-eared myotis (federal candidate), long-legged myotis (federal candidate), yuma myotis (federal candidate), and pallid bat (state special concern). The bat species forage in tree canopies or along the ground under shrubs. However, the project corridor may be utilized as a travel way by the bats after pipeline establishment occurs. Impacts also include the reduction of roosting habitat. The removal of foraging and roosting habitat may cause slight reduction in the availability of suitable roost sites in the area. However, clearing any potential roost trees will occur after the breeding season, thereby minimizing potential impacts.

Removal of trees in wooded areas may also adversely effect the spotted skunk (federal candidate) and the loggerhead shrike (state special concern). Habitat of the milk snake may be potentially affected with both the proposed route and the Bluewater Creek Alternate. This species utilizes woodlands and rocky side slopes, and has been identified as occurring southeast of Billings approximately 0.2 mile from Segment A_0 and 0.7 mile west of Segment D_1 (see Table 4-12). Similar habitat that may be suitable for the milk snake also occurs along Segments D_1 and the Bluewater Creek Alternate.

Based upon available habitat within the project area, the potential exists that the bald eagle (endangered) and the peregrine falcon (endangered) may occur in the vicinity of the study alternates. As discussed in Section 4.9, changes in habitat and water quality of riverine systems could potentially occur as a result of construction activities. However, these changes are expected to be minimal and will not significantly impact either of these species or their food base. A peregrine falcon nesting site has been identified by MNHP as occurring southeast of Billings near Segment A_1 (0.4 mile). Additionally, potential raptor nesting sites occur along Segments F_1 and F_2. Areas used for breeding and containing active nest sites should be avoided from February through July and should be restricted to a 2.5-mile radius for bald eagle and a 0.75-mile radius for peregrine falcon (Saville, 1996, BLM). The proposed dates for construction activities are between July 15, 1996 and the end of 1996. Therefore, impacts to raptor breeding and nesting activities during construction activities are possible. If the proposed pipeline route crosses areas where active raptor nesting occurs, mitigation measures will be implemented to avoid and minimize adverse impacts. The impacts related to an oil spill on water quality and wildlife will be significant should it occur. The spill could cause mortality of fish and other aquatic species such as insects, reptiles, and amphibians, thereby reducing the food supply of numerous wildlife species including the bald eagle.

Seven state-listed plant species have been documented as potentially occurring near Bluewater Creek and the Bluewater Fish Hatchery. However, none of the species are federally listed as either threatened or endangered. These species include parrot-head Indian paintbrush (state special concern), giant helleborine (state special concern), rabbit buckwheat (federal candidate), Joe-pye weed (state special concern), beaked spikerush (state special concern), and swamp milkweed (state special concern). All of these species are documented as occurring within the vicinity of Bluewater Fish Hatchery (see Figure 3-5). The proposed route (D_1) is 0.7 miles from this area. Because of this distance, the locality containing these species is not expected to be adversely affected by the proposed project corridor. Another site near the Bluewater Creek Alternate may potentially contain sensitive species including rabbit buckwheat, giant helleborine, and Indian paintbrush. These species may occur 0.4 mile from the proposed route (D_1) and 1.6 miles from The Express Alternate (D_2). Gray's milkvetch may be directly impacted by Segment E south of Bowler, whereas Geyer milkvetch is 0.5 miles from the Polecat Bench Alternate (F_2) and 0.9 mile from the proposed route (F_1). Habitat for these species may occur along each of the alternate routes in this area. Surveys are not planned as components of preconstruction activities. If rare plant species are encountered within the construction ROW of the selected pipeline route, mitigative measures can include shifting the alignment, transplanting affected species to suitable habitat, or collecting seed and/or rootstocks for revegetation outside the ROW.

4.12 Cultural Resources

Effects to cultural resources occur only when the properties are considered to be eligible to the NRHP. Historic properties can be eligible to the NRHP because they are associated with a significant event or theme in history (Criterion A), because they are associated with a significant historic person (Criterion B), because they are representative of a type or the work of a master (Criterion C), or because they have potential to yield important information about the history or prehistory of an area (Criterion D). Effects to properties eligible to the NRHP under Criterion A, B or C may be either physical or visual. Effects to sites considered eligible under Criterion D are usually only physical.

The following discussion of effects to cultural resources considers only those sites that appear to be on one or more alternates, and are either eligible to the NRHP or of unknown eligibility. Ineligible properties are not discussed.

There are four types of cultural resources found on the proposed route and the various alternates being considered in this document. The first is irrigation canals. When the physical integrity of these historic linear sites is intact, physical effects to the historic property can be avoided by boring under the canal. When physical integrity is lacking, the canal will probably not be considered eligible for listing to the NRHP and, therefore, there will be no project related effects. Visual effects are rarely considered when dealing with irrigation ditches.

The second type of cultural resource found in the project area is historic transportation conduits including historic roads, trails, and railroads. Resources of this type may be crossed in multiple locations. When the physical integrity of these historic linear sites is intact, any physical effects to the historic property can be avoided by boring under the road, trail or railway. Potential visual effects, like the physical integrity of these resources' particular locations, can only be determined by field evaluation, and thus are unknown at this time.

The third type of cultural resource associated with this project are historic cultural material scatters associated with the homesteading era. None of these have standing structures. Some contain foundations. Effects to these properties can be avoided by re-routing around them since they are considered to be significant due to their information potential (Criterion D). If they cannot be avoided, mitigation of effects to these sites can be accomplished through data recovery/ excavation.

The fourth type of cultural resource crossed by the various alternates are prehistoric sites. Most of these contain only chipped stone debris but some contain hearths and/or ground stone materials and/or ceramics. One contains tipi rings while one other contains a stone alignment. Like the historic cultural material scatters, effects to these properties can be avoided by re-routing around them since they are considered to be significant due to their information potential. If they cannot be avoided, mitigation of effects to these sites can be accomplished through data recovery/ excavation.

The proposed route will cross, at a minimum, three historic irrigation ditches (Yegen Drain, Grey Eagle Ditch, and an unnamed ditch), historic roads in 27 locations, three sites eligible to the NRHP, and six sites with unknown eligibility (Table 4-13).

The three eligible sites include the Bozeman Trail, the Bridger Cut-Off of the Bozeman Trail (crossed in six locations), and the Fromberg Cut-Off of the Chicago, Burlington and Quincy Railroad.

The six sites with unknown eligibility include the Coulson City dump and Clark's Cabin in the immediate Billings area, 24CB135, 48PA432, 48PA458, and 48PA474. The Coulson City dump has not been formally recorded but is in the immediate vicinity of the refinery. Clark's Cabin is shown on the original survey plat for T1SR26E but has not been formally recorded.

Site 24CB135 is an historic homestead site consisting of three sandstone foundations, a well, and two trash concentrations. Testing of this site resulted in the site being recommended by Archaeological Services as potentially eligible to the NRHP due to its potential to yield important historic archaeological information (Rosenburg, 1981). The Montana SHPO files do not indicate whether or not the site has been determined eligible (Kurtz, 1996 personal communication). If the site is determined to be eligible, it may be possible to avoid project related effects by re-routing to avoid the site. If site avoidance is not a viable option, then mitigation of the project effects may be accomplished through data recovery/excavation.

Site 48PA432 is a cultural material scatter containing three hearths, fire-cracked rock, lithics, and some historic debris. The site has not been tested or evaluated for NRHP eligibility. The exact location of the site cannot be determined from the site form. Field checking the proposed route will be necessary to determine if the site will be affected by the proposed project.

Site 48PA458 is a cultural material scatter containing one hearth and lithics. The site has not been tested or evaluated for NRHP eligibility. The exact location of the site cannot be determined from the site form. Field checking the proposed route will be necessary to determine if the site will be affected by the proposed project.

Site 48PA474 is a scatter of historic debris associated with the development of the Elk Basin oil field. This site has been recommended by Powers Elevation archaeologists as ineligible to the NRHP due to its lacking the potential to yield important information about the development of the oil field. According the Wyoming SHPO records, no federal agency has determined the eligibility status of the site and consequently the SHPO has not commented on the site.

In comparison to the proposed route, the Billings Boulevard Alternate will cross the same number of historic irrigation ditches (2), the same number of historic roads (6), and one less site of unknown eligibility (Coulson City Dump). As a result, the Billings Boulevard Alternate will result in a slightly reduced impact to known cultural resources.

As is presented in Table 4-13, the Blue Creek Alternate will result in a greater potential impact to cultural resources. This alternate route will result in the crossing of 8 more historic roads and one site of unknown eligibility (monumental historic cairn). Potential impacts to the historic roads may be mitigated by drilling underneath the roadbed, whereas the potential effects to the cairn could be mitigated by shifting the alignment of the route.

Neither the Bluewater Creek Alternate or the proposed route were determined to affect any previously recorded sites.

The Express Alternate will necessitate the crossing of 15 fewer historic roads as compared to the proposed route (see Table 4-13). However, it will also potentially affect 2 additional eligible sites (lithics, 24CB1268 and the Lyle homestead, 24CB1281) as compared to the proposed route.

The Polecat Bench Alternate will result in potentially greater impacts to cultural resources as compared to the proposed route. Although this route will affect one fewer eligible sites and 9 fewer sites of undetermined eligibility. Mitigation of potential impacts to these sites may consist of avoidance by shifting the proposed route or excavation and data recovery.

4.13 Hazardous Materials

As discussed in Section 3.15, a number of potentially contaminated sites may be located in the vicinity of the proposed pipeline route. The vast majority of these sites are located in and around the Billings, Montana area. With the exception of the Conoco refinery, the exact locations of many of these contaminated areas could not be determined from the information reviewed. It is not known whether or not any of these sites will be crossed by the proposed pipeline route.

Prior to construction, further coordination with the MDEQ should be conducted to ascertain the precise location of contaminated sites. If the possibility of encountering toxic contamination exists, appropriate measures should be taken to protect worker health and safety.

4.14 Construction Impacts

4.14.1 Drainage

Control of erosion from construction area and retainage of siltation are two principal concerns of construction impacts as they relate to drainage. Each alternate will utilize current state standards for erosion control and retainage of silt to prevent or reduce downstream impacts to receiving streams due to construction. These measures include the use of temporary berms, slope drains, ditch checks, sediment basins, seeding and mulching, straw bales, and silt fences.

4.14.2 Solid Waste Disposal

Any solid waste impacts generated during construction will be temporary. Solid waste produced by clearing operations will normally be disposed of on-site by controlled burning, in compliance with all local, state, and federal regulations. Construction debris such as used forms, maintenance waste, and general trash will be collected and disposed of at local landfill locations. There will be no long-term impacts associated with solid waste disposal.

4.14.3 Detours and Accessibility

Construction activities are likely to impact local traffic flow on a short-term basis. Where access is provided from a local road to the proposed ROW, impacts to the local roads and traffic patterns are expected to be limited to brief periods while the pipeline is drilled under the roadway. Similarly, secondary roads that will be crossed by trenching may be expected to have short-term delays, detours, and temporary road closures.

4.14.4 Utilities and Other Pipelines

Each of the route alternates will cross existing utilities at various points along their entire length. Utility service to the user can be maintained during construction by phased adjustments to the utility in conjunction with construction operations on the spread.

4.14.5 Water Quality and Ecology

Several of the construction-related impacts are expected to be temporary. Fish and benthic macroinvertebrate communities are known to recover quickly once construction activity has ceased. During the construction phase, however, siltation and sedimentation may result in the displacement of aquatic fauna and reduced reproductive success. The utilization of best management practices such as erosion control devices, scheduling of construction during dry seasons and after fish spawning, and use of dry crossing techniques, will further reduce construction-related impacts. Construction activities that will result in long-term impacts, such as alteration of substrate by filling spaces between gravel with silt, will be minimized.

In addition, potential effects of the proposed construction include increased turbidity and sedimentation at each of the stream/wetland crossings. Construction-related impacts can be prevented by prohibiting the discharge of harmful wastes into or alongside floodplains, preventing placement of excavated material into floodplains, and restricting the frequent fording of streams and floodplains by equipment or through the use of a bridge over flowing streams. Water quality impacts will be further minimized by strict adherence to erosion and sediment control procedures.

Following the construction phase, ROWs will also be planted using a mix of grass (e.g., *Agropyron smithii, Phleum pratense, Festuca pratensis, Alopecurous pratensis*) and forb species, thereby enhancing soil stabilization and providing cover and forage to local wildlife.

4.14.6 Air Quality

Measures will be taken to reduce fugitive dust and other emissions generated during construction. Emissions from construction equipment will be controlled in accordance with emission standards prescribed under state and federal regulations. Materials resulting from clearing and grubbing, demolition, or other operations (except materials to be retained) will be removed from the project, burned, or otherwise disposed of by the contractor. Any burning, when permitted, will be conducted in accordance with applicable local laws and state regulations.

4.14.7 Noise

Noise levels in the project corridor will increase during the pipeline construction phase. Much of this noise will result from the operation of construction equipment. Due to the proposed pipeline location and the short duration of the construction period, it is unlikely that potentially sensitive receptors (hospitals, schools, churches) will be negatively affected by the short-term increase in noise levels.

4.15 Safety

Underground pipelines represent the safest and most cost efficient method of transporting petroleum liquids and their by-products. Other means of transport (e.g., truck, barge or railroad) generally have poorer safety records as they are more prone to accidental spills resulting from collision, grounding, derailment, etc. Pipeline transport minimizes the potential for accidental spills as the buried pipeline is not subject to many of the factors causing truck, rail or barge related spills.

In spite of its greater safety, the placement of a new pipeline creates an increased potential for accidental spill. For example, a total of 421 pipeline spills were reported in the United States from 1984 to 1987. Of these, 17 spills exceeded 210,000 gallons of liquid (PAES, 1989). Construction of the proposed pipeline, therefore, represented a potential source of soil, groundwater, and surface water contamination. Accidental releases of products carried by the proposed pipeline will cause soil contamination, mortality of aquatic organisms, contamination of water supplies, and other impacts depending on specific release locations.

Several safety factors will be included in the design and maintenance of the proposed pipeline. For example, all pipe segments will have cathodic protection to minimize deterioration over time. In addition, automatic valves designed to close in the event of a line break will be installed at prescribed intervals, thereby minimizing the release of product. Annual inspections will be made along the entire route to detect leaks. In addition, monthly surveys will be conducted to monitor activities potentially affecting pipeline safety (e.g., unrelated construction activities). These practices will further reduce the potential for accidental spills in the study corridor.

4.16 Unavoidable Adverse Impacts

Although some of the potential adverse impacts can be reduced or prevented, certain impacts cannot be avoided during pipeline construction. Such impacts for the proposed Beartooth Pipeline include:

- The visual character and aesthetics in the vicinity of the proposed route will change as a result of the construction of the proposed pipeline.
- While all precautions and safety measures will be strictly adhered to, the construction, operation and maintenance of the proposed facility represents a potential for release of oil into the environment in areas where such a potential previously did not exist.
- A direct and long-term impact will result from the conversion of forested land to ROW along a small portion of the proposed route as well as the alternatives to the proposed route.
- Habitat losses and alterations of terrestrial habitats for each of the build alternates will impact the terrestrial wildlife in the study area, particularly during the construction phase.
- Land use productivities of the areas in which the topsoil is removed or inverted may change.

These impacts will be minimized to the extent possible by using appropriate construction methods, design techniques, and mitigation measures as discussed elsewhere in this document.

4.17 Secondary and Cumulative Impacts

The assessment of environmental consequences involves the evaluation of both direct and indirect actions (i.e., impacts to wetlands, soils, surface water, etc.) associated with a given project. However, the combined effects of similar projects, or dissimilar projects within the same region, may also incur effects on a different scale. As such, additional impacts may arise from the construction and operation of the Beartooth Pipeline facility in conjunction with other actions. These impacts can be identified as either secondary or cumulative. Generally, secondary impacts are effects which arise as a consequence of a particular action, and not directly related to, or components of, the action itself. Secondary impacts are typically those that occur at a later time or distance from the triggering action. An assessment of such impacts has been incorporated into each of the previous sections in Section 4.0, where appropriate.

In contrast, cumulative impacts are the collective impacts of the proposed action in conjunction with other past, present, or reasonably foreseeable future actions that are related to the proposed action by virtue of a similar geographic location, timing, or similarity in type of action.

The determination of cumulative impacts for this document is limited to assessing the impacts of the proposed action in relation to past and present actions, as well as those that are expected to occur in the foreseeable future. Such actions under consideration in this assessment include the construction and operation of the Express, Cenex, and Altamont Pipelines as well as other pre-existing pipelines. Construction for the Express Pipeline is expected to occur within the same season as the Beartooth Pipeline (summer of 1996), the Cenex Pipeline has been completed, and the Altamont Pipeline may be installed in the near future.

Cumulative impacts associated with each of these actions may be expected to occur during both the construction and operational phases of the project. Because of their similar timing, the construction phases of the Beartooth and Express Pipelines will collectively increase the magnitude of the primary and secondary impacts related to each action. Some of these impacts may include the following:

- An increase in local employment opportunities;
- An increase in local earnings-based compensation;
- An increase in the need for skilled workers;
- A heightened need for temporary housing;
- An increase in county property tax revenues and ROW easement payments;
- Temporary interruption of land use activities within the vicinities of construction ROW and access points;
- Alteration of local traffic patterns and traffic composition at selected secondary roads;

- An increased degree of impact to various terrestrial cover types;
- An increase in the potential need for community services and facilities and emergency response personnel;
- A greater number of receptors potentially affected by construction related noise;
- An increased potential to impact cultural resource sites (discovered or undiscovered);
- An increased potential for soil-related impacts within the construction ROW, possibly resulting in reduced productivity on rangeland and croplands;
- An increased potential for noxious weed invasion due to the greater number of acres of soil and vegetation disturbance;
- An increase in the number of ephemeral, temporary, and perennial stream pipeline crossings thereby increasing the potential for siltation and sedimentation; and
- An increased need for water for the hydrostatic testing of pipeline integrity.

Many of the effects associated with pipeline facility installation are anticipated to be short-term; however, the magnitude of disturbances increases with each pipeline that is added to the regional pipeline infrastructure (i.e., Cenex, Express, and Altamont).

Parallel routing of proposed pipelines may also increase the magnitude of cumulative impacts. In the southern portion of the project area, the Express and Altamont Pipelines are located along a parallel route. Cumulative impacts associated with these actions have previously been assessed in the Final EIS for the Express Route (MDEQ, 1996). One of the alternative routes in consideration as part of this environmental document is the Express Alternate of the Beartooth Pipeline. The route of this alternate parallels the route of the Express Pipeline for more than 13 miles (see Figure A-4). Potential impacts associated with the construction of these facilities within these areas are therefore potentially magnified by the greater ROW required, and the similarity in timing of construction. The capacity to reclaim these areas by reestablishing preconstruction vegetative cover or soil productivity may, therefore, be reduced within this area. In addition, potential impacts to cultural resources, landowners (access, land use, etc.), and ecological resources (e.g. cover types and habitat, prairie dog towns, threatened and endangered species) may also be greater due to the increased area and duration of disturbance. In contrast, by incorporating parallel routing along an existing or proposed pipeline, the potential impact on land use, aesthetics, and habitat contiguity may be expected to be diminished. Such a reduced cumulative impact may be expected to result from the installation of the Express and Polecat Bench Alternates of the Beartooth Pipeline.

The installation of multiple pipelines, whether natural gas or crude oil, also has an impact during the operational phase. In particular, each facility will result in minor increases in employment in order to operate and maintain the facility. In addition, the installation of multiple pipelines increases the potential for adverse impacts to the human and natural environments that may occur as a result of a release of oil into the environment. Pipeline construction and strict adherence to installation procedures should ensure that the pipeline will be constructed in such a manner as to minimize the possibility of an unwanted release into the environment. Constant pipeline monitoring, routine maintenance, and emergency spill response plans will also minimize the potential for adverse impacts to the environment.

4.18 Analysis of Regulatory Restrictions

State regulations require that every document prepared in compliance with the provisions of MEPA must include "any regulatory impacts on private property rights including whether alternatives that reduce, minimize, or eliminate the regulation of private property rights have been analyzed" [MCA 75-20-201(1)(B)(IV)(c)].

A number of alternatives were considered through the EA. Those included an economic analysis of pipeline system alternatives and a comparison of the project benefits and the No Action Alternative, routing options for the pipeline, construction measures for crossing of streams, and other measures to reduce impacts identified as a result of the proposed project construction procedures.

Any of the proposed routing options considered in the EA could receive the necessary state, local or federal approvals necessary for the project. With the exception of a few parcels of state or federal lands crossed, most of the pipeline route would cross privately held lands under the various route segment alternates. As a result, the owners of the Beartooth Pipeline would rely on the negotiations with individual private landowners or, if negotiations fail, the exercise of the power of eminent domain to condemn for the rights to construct and operate the project on these lands.

Based on the methods proposed by the project sponsors, MDEQ identified several alternative measures or environmental restrictions for the project and is presenting them for public comment. These measures are discussed here in qualitative terms, actual costs have not been obtained. In most instances, the proposed measures would require additional up-front costs but would either reduce identified impacts or increase revegetation success. The measures identified by MDEQ that would involve measures more restrictive than those proposed by the project sponsors are discussed below.

4.18.1 Stream Crossing Methods

The project sponsors propose to cross eight perennial streams using a modified wet trench crossing method where the stream is crossed using a standard trench for the pipeline but a culvert is installed in the stream to allow for crossing by construction traffic. This method reduces sediment production caused by traffic across the stream, but does not reduce sediment generated during trenching operations. MDEQ considered several alternative techniques for crossing flowing streams, but concluded that one method was the most feasible for the project to reduce impacts to flowing streams. This method, known as the Dry Trench Crossing Method, would use a dam and pump or flume to divert water over the work area where the pipeline is to be installed. This technique would reduce sediment generated by trenching as well as from traffic crossing the stream, producing smaller amounts of sediment during construction. Based on past pipeline experience, MDEQ estimates that this method could increase the cost for each crossing in the range of $2,000 to $5,000, but may reduce the extent of disturbance at individual streams and the associated reclamation costs.

4.18.2 Topsoil Salvage Methods

The project sponsors propose to salvage topsoil in areas of cultivation but not in areas where rangelands would be crossed. Failure to salvage topsoil on rangeland would result in soil mixing and loss of soil productivity for a period of years depending on soils and subsoils. As an alternative, topsoil salvage, separation and replacement along the length of the pipeline to depths appropriate to the soil crossed would increase the success of reclamation activities on all lands. This measure would increase construction cost, but may lower long-term erosion control and reclamation costs for the project.

4.18.3 Sensitive Plants and Cultural Resource Protection Measures

A complete survey for rare plants and historic, archaeologic or palenotologic resources has not been conducted along the routes under consideration for the pipeline. Information available from database searches reveals the presence of rare plants and cultural resources in the vicinity of the pipeline routes and suggests that additional sites or locations are present, particularly in undisturbed areas. For some Montana landowners, the presence of a rare plant or cultural site is viewed as a hindrance to use of the land, while others view their presence as an asset.

The pipeline sponsors have proposed measures to address impacts at known locations of rare plants and important cultural sites as noted in the text. The project would still pose some threat to rare plants or cultural sites discovered during construction when the flexibility to route the pipeline to avoid the features is limited.

Rare Plants

Unless individual landowners request otherwise, a search should be conducted of the ROW crossing undisturbed lands having high potential for habitat for rare plant species. This effort could become part of preconstruction activities to further identify areas where habitat for rare plants could be avoided by field adjustments or where efforts during revegatation could be undertaken to reestablish rare plant communities if warranted. This measure could increase construction costs, but would help promote understanding of ecological systems and voluntary efforts on the part of landowner and the pipeline companies to prevent or eliminate damage to rare or unique habitats found in this part of Montana.

Cultural Sites

Unless individual private landowners request otherwise, a survey of areas having high probability for discovery of cultural sites should be conducted, with the purpose of identifying important sites which should be avoided or to recover information that would otherwise be lost as a result of construction disturbance at important sites. This measure would increase construction cost, but would further the understanding of an area of the state recognized as having a culturally diverse past in a cooperative manner with individual landowners.

5.0 List of Preparers of the Draft EA

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Appendix

Tables

Environmental
Science &
Engineering, Inc.

A CILCORP Company

Appendix A

Maps of Beartooth Pipeline Project Area

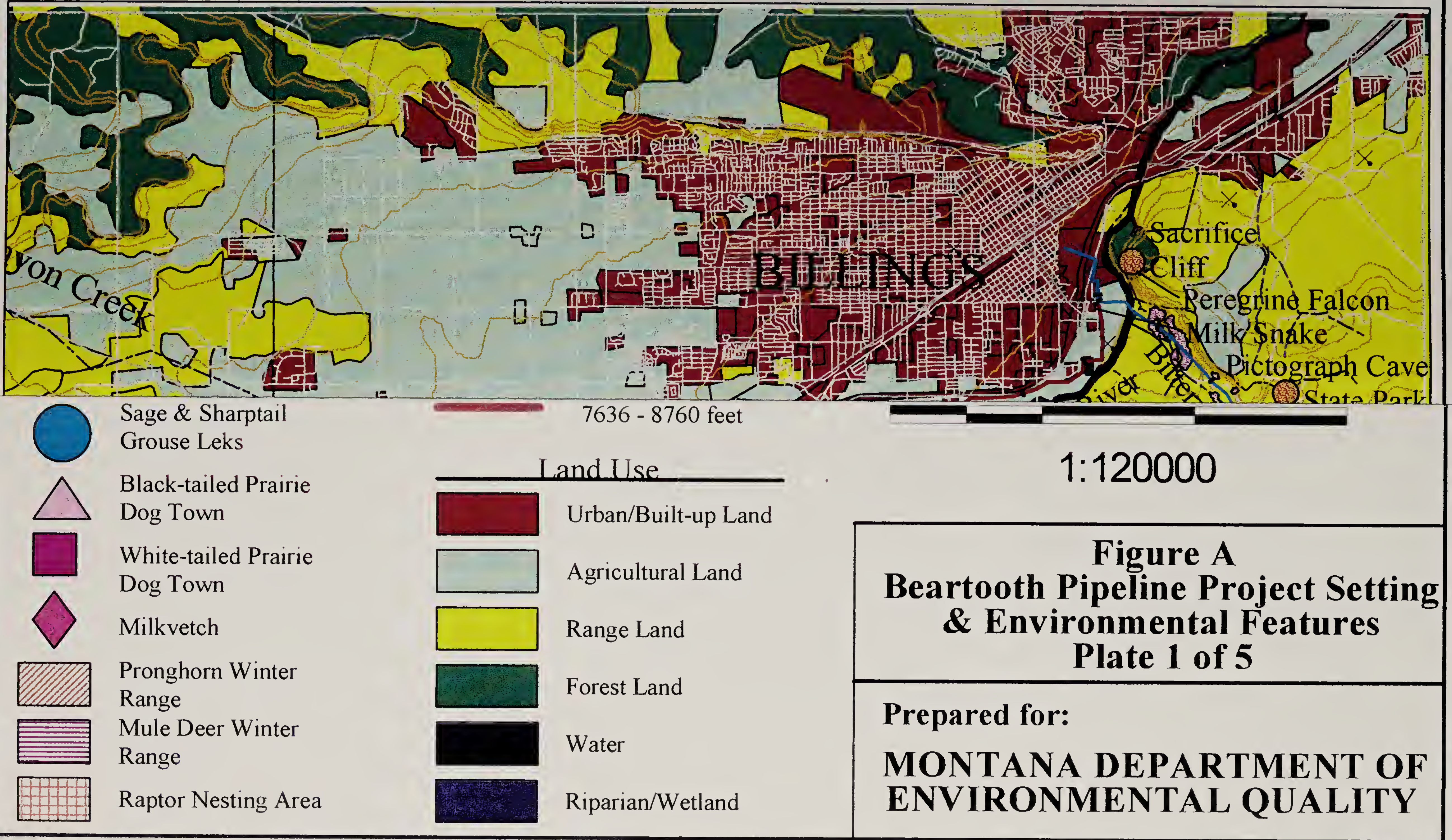

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 1 of 5

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

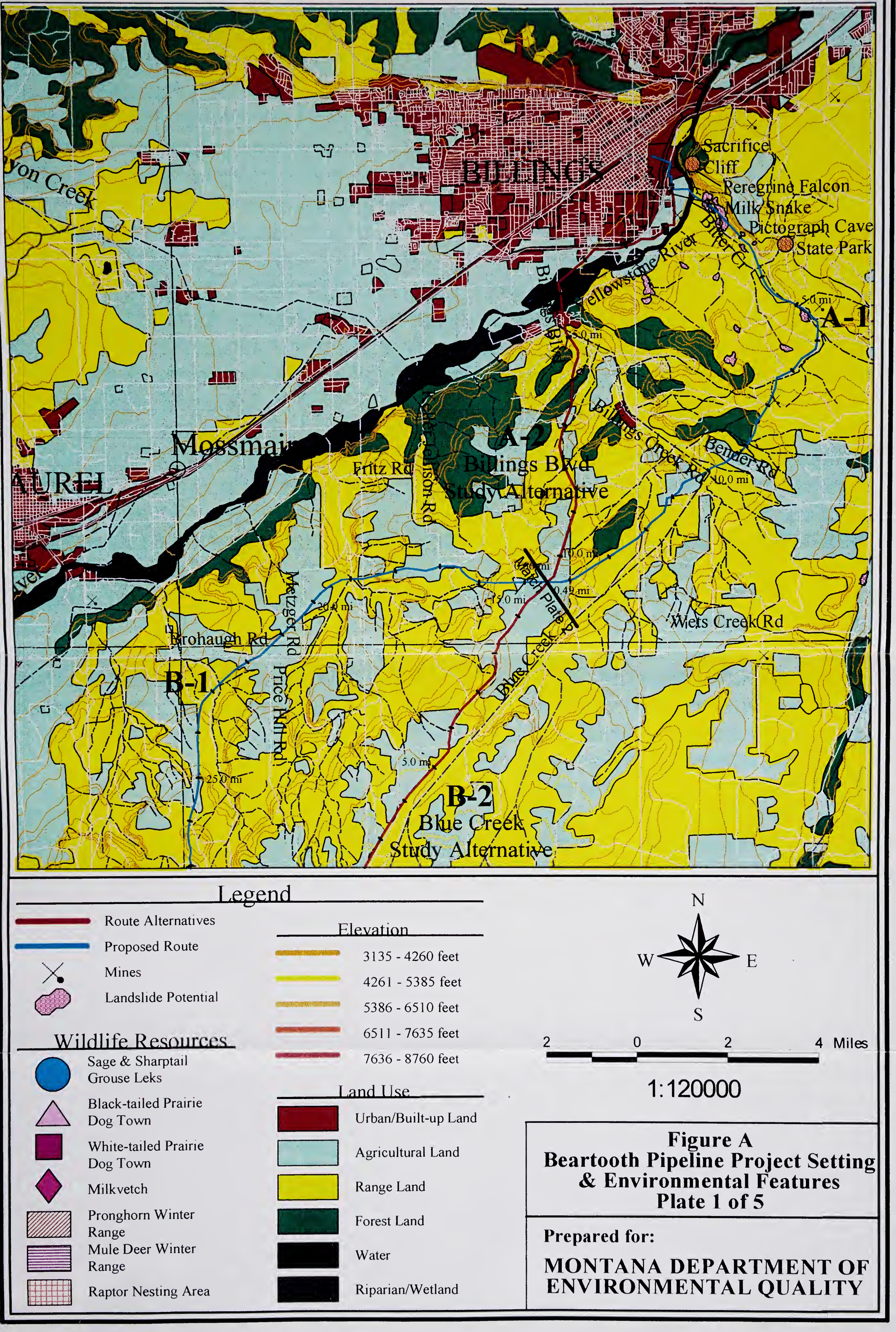

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 1 of 5

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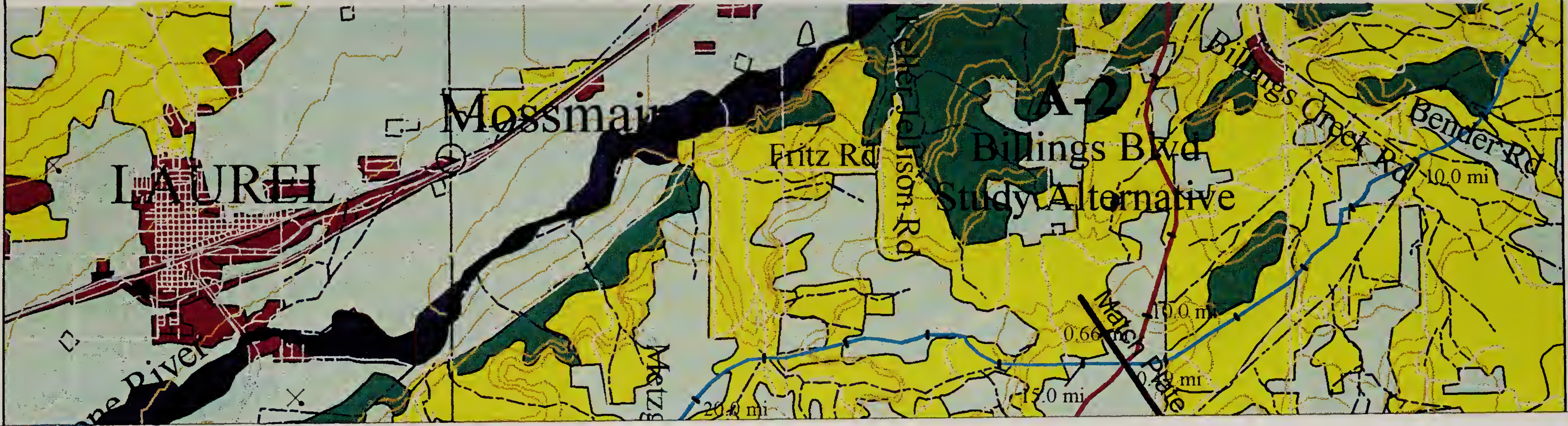

- ● Grouse Leks
- △ Black-tailed Prairie Dog Town
- ■ White-tailed Prairie Dog Town
- ◆ Milkvetch
- ▨ Pronghorn Winter Range
- ▤ Mule Deer Winter Range
- ▦ Raptor Nesting Area

Land Use

- 🟥 Urban/Built-up Land
- ⬜ Agricultural Land
- 🟨 Range Land
- 🟩 Forest Land
- ⬛ Water
- 🟦 Riparian/Wetland

1:120000

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 2 of 5

Prepared for:

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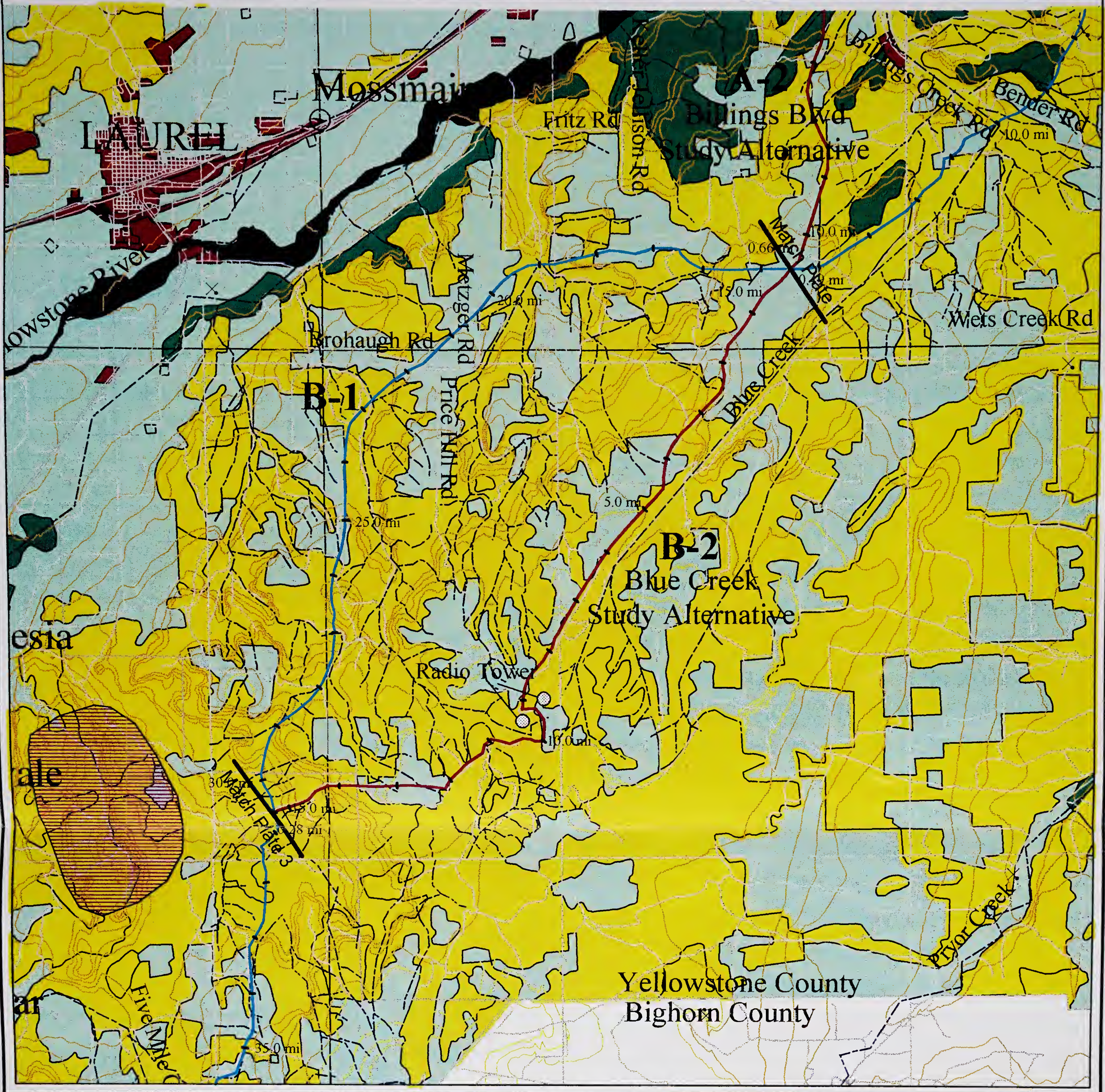

Legend

- ▬ Route Alternatives
- ▬ Proposed Route
- ✕ Mines
- ▨ Landslide Potential

Wildlife Resources

- ● Sage & Sharptail Grouse Leks
- △ Black-tailed Prairie Dog Town
- ■ White-tailed Prairie Dog Town
- ◆ Milkvetch
- ▨ Pronghorn Winter Range
- ▤ Mule Deer Winter Range
- ▦ Raptor Nesting Area

Elevation

- ▬ 3135 - 4260 feet
- ▬ 4261 - 5385 feet
- ▬ 5386 - 6510 feet
- ▬ 6511 - 7635 feet
- ▬ 7636 - 8760 feet

Land Use

- 🟥 Urban/Built-up Land
- ▭ Agricultural Land
- 🟨 Range Land
- 🟩 Forest Land
- ■ Water
- ■ Riparian/Wetland

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Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 2 of 5

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

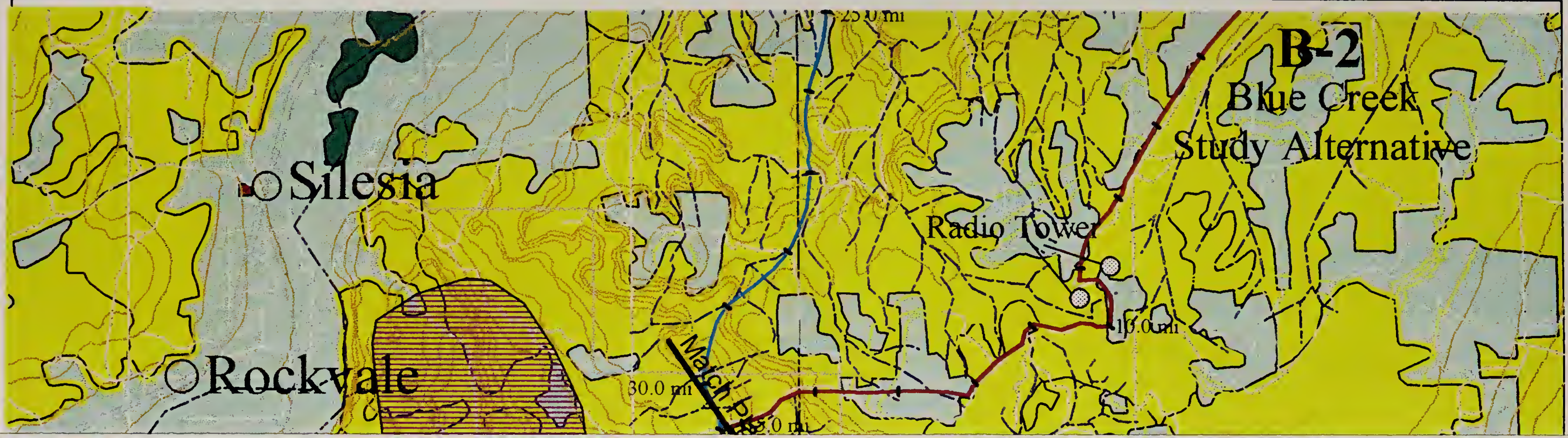

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 3 of 5

Prepared for:

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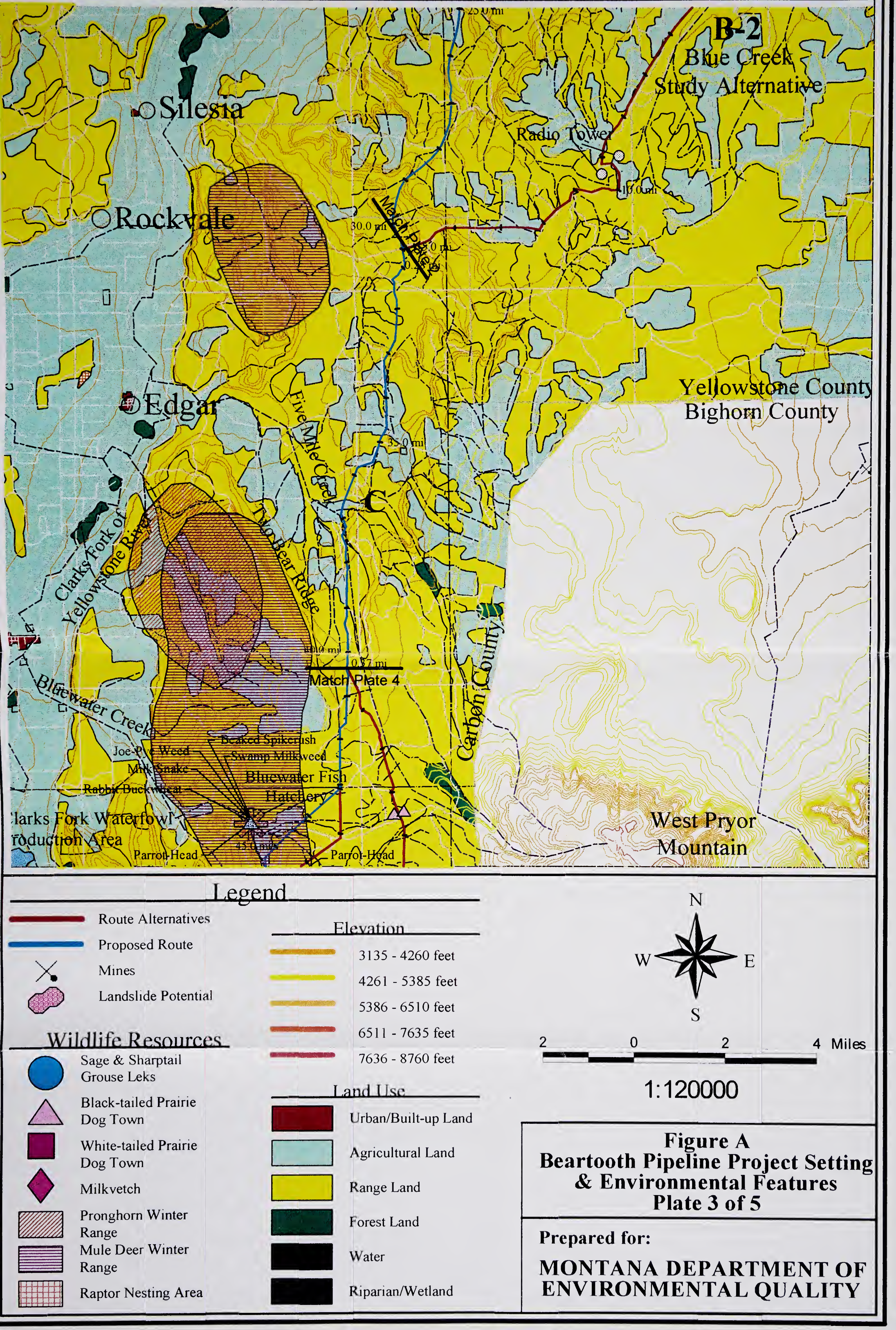

Figure A
Beartooth Pipeline Project Setting
& Environmental Features
Plate 3 of 5

Prepared for:

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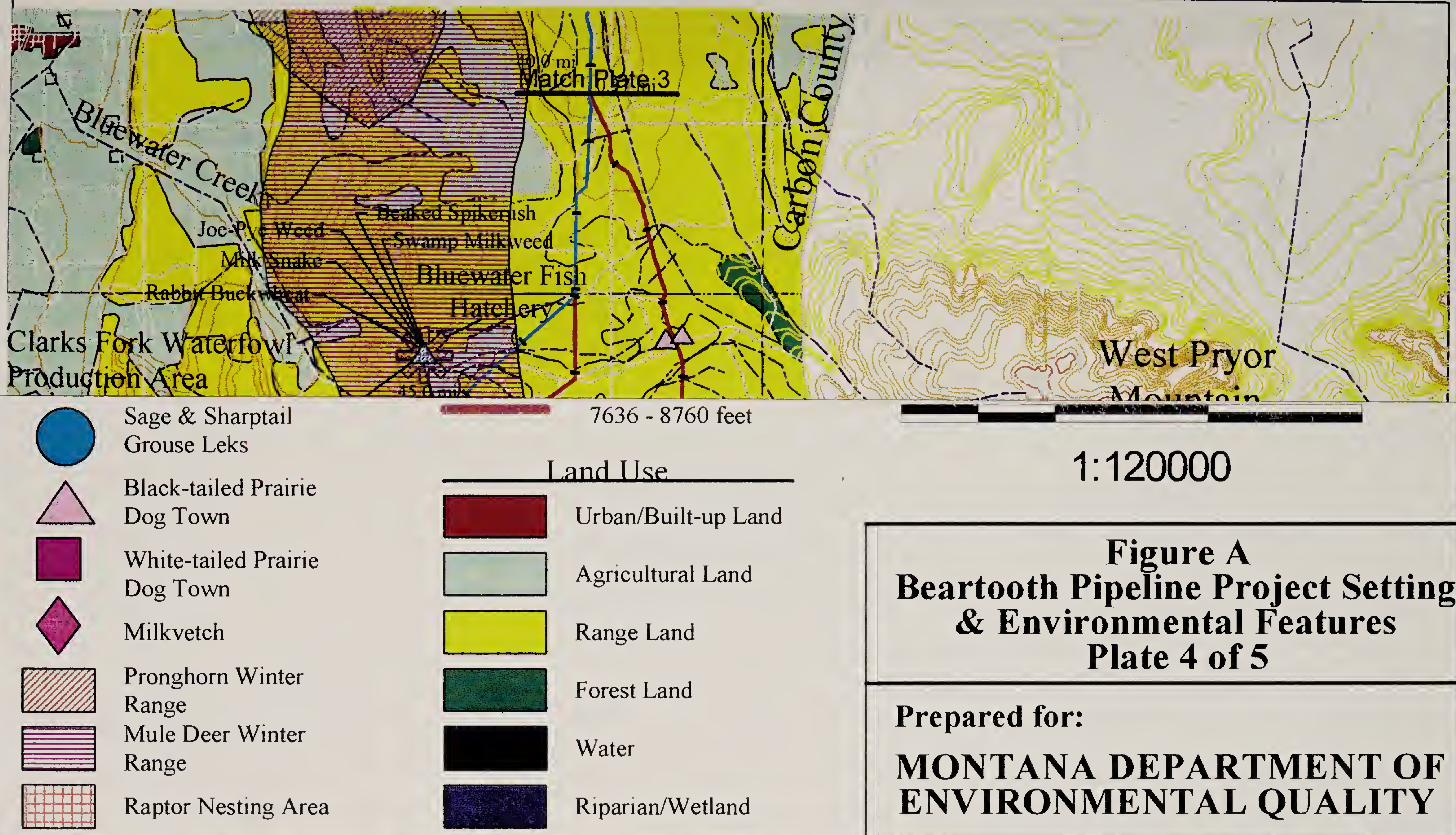

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 4 of 5

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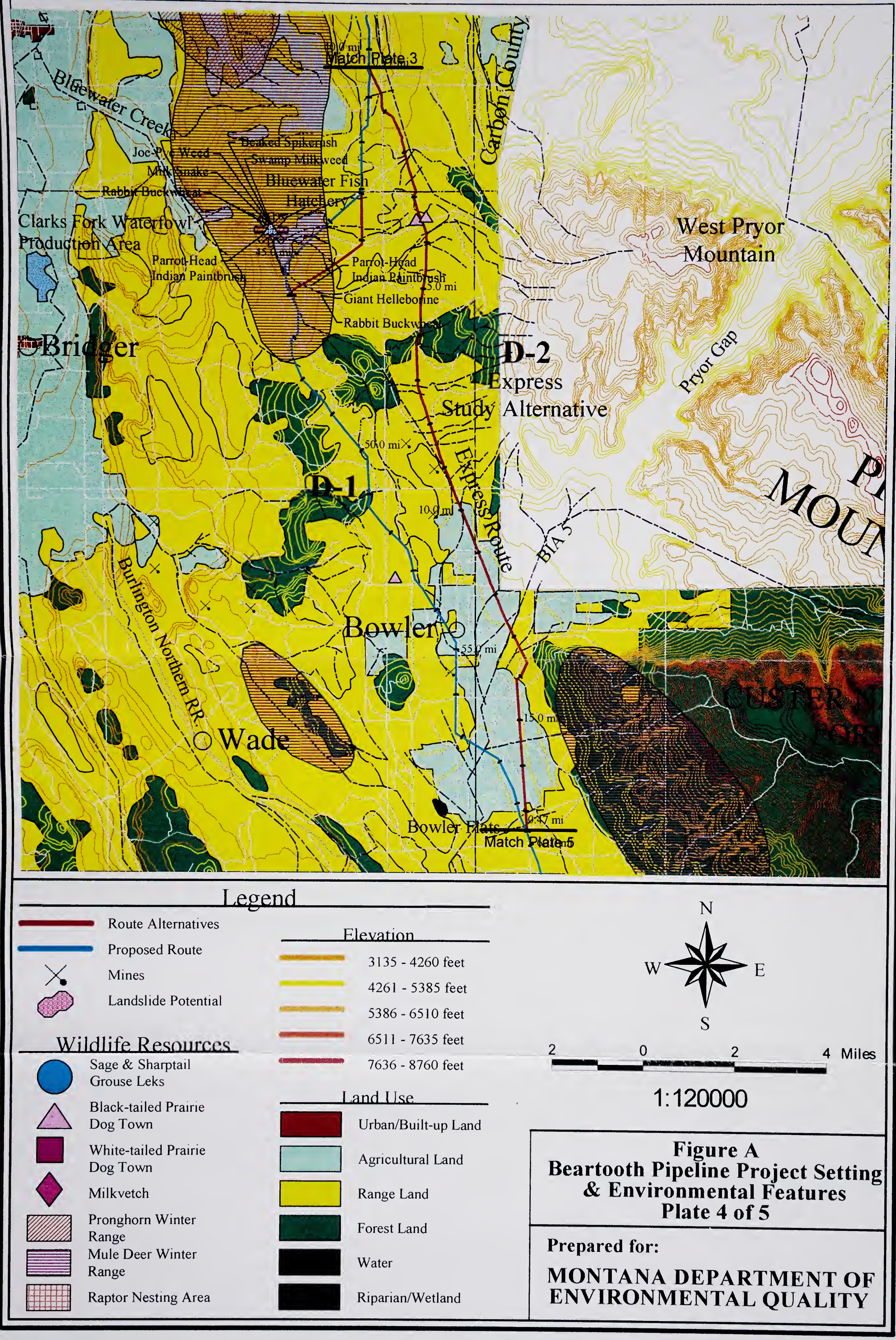

Figure A
Beartooth Pipeline Project Setting
& Environmental Features
Plate 4 of 5

Prepared for:

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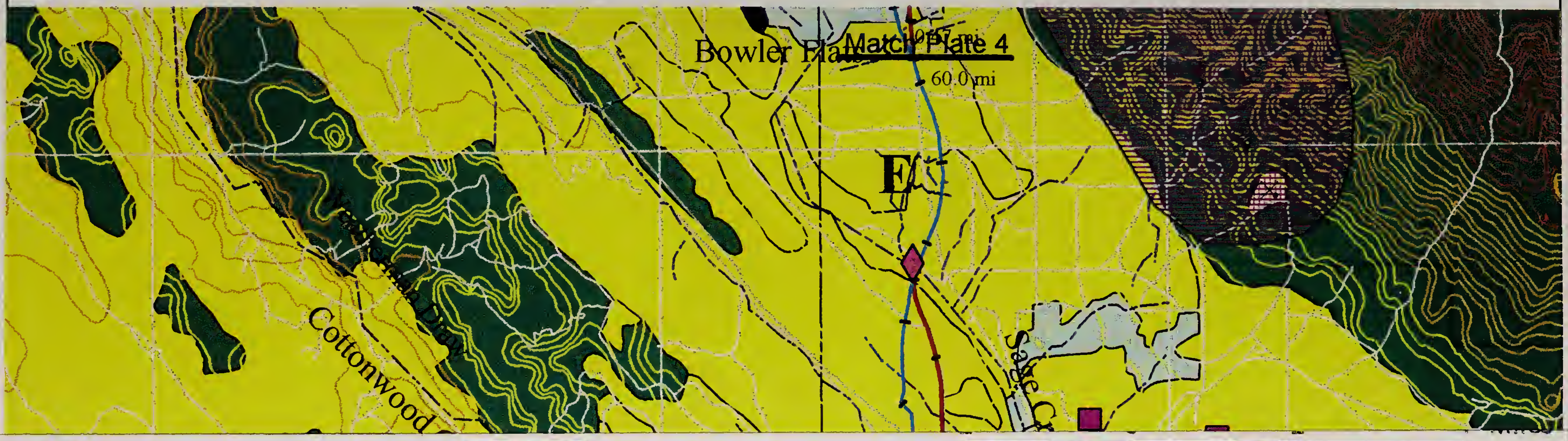

●	Sage & Sharptail Grouse Leks
△	Black-tailed Prairie Dog Town
■	White-tailed Prairie Dog Town
◆	Milkvetch
▨	Pronghorn Winter Range
▤	Mule Deer Winter Range
▦	Raptor Nesting Area
▬	7636 - 8760 feet

Land Use

🟥	Urban/Built-up Land
⬜	Agricultural Land
🟨	Range Land
🟩	Forest Land
⬛	Water
🟦	Riparian/Wetland

1:120000

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 5 of 5

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

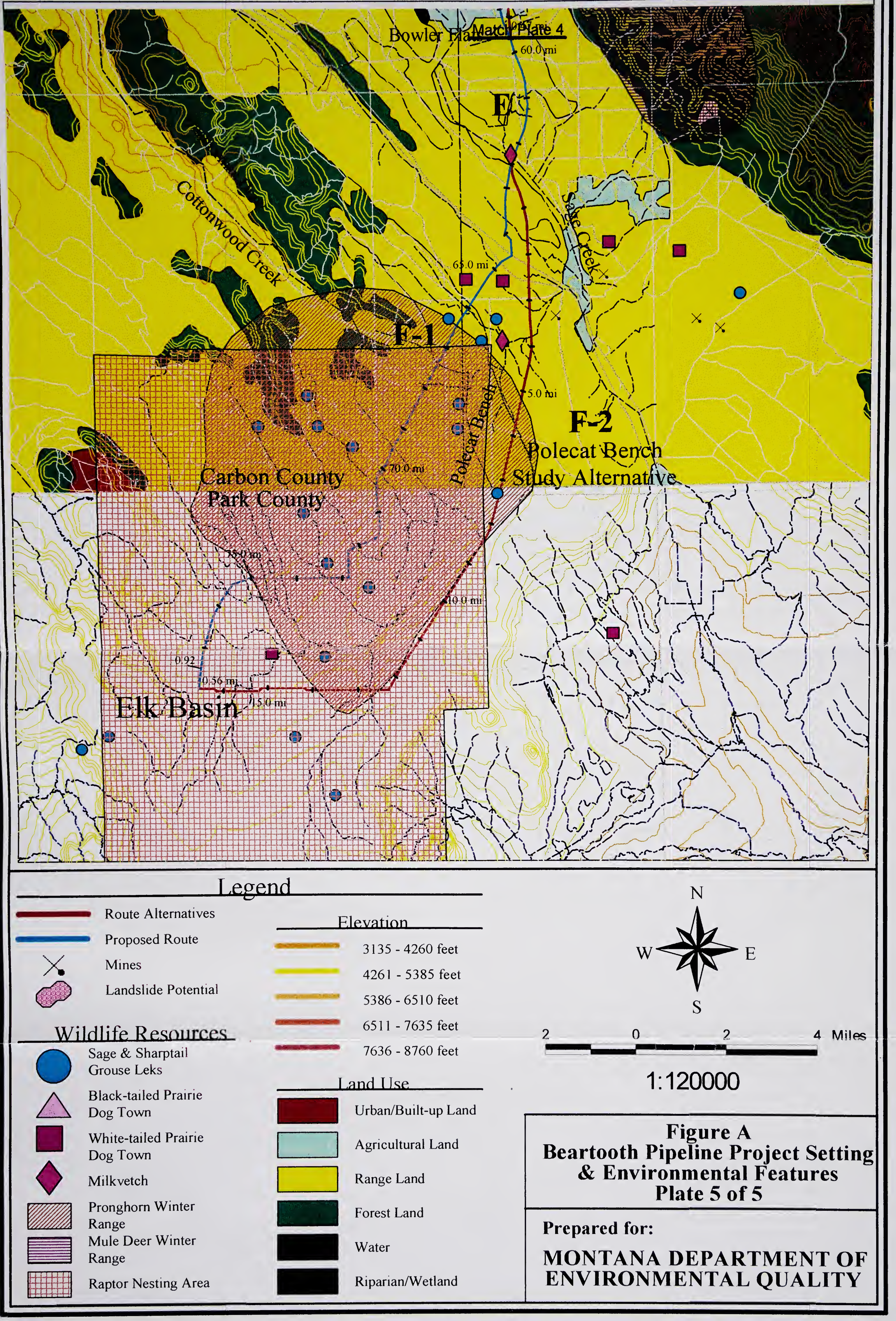

Figure A
Beartooth Pipeline Project Setting & Environmental Features
Plate 5 of 5

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Appendix B

Transportation and Utility, Watercourse, and Wetland Crossings for the Proposed Route and Alternate Route Segments, Beartooth Pipeline

Table B-1. Beartooth Pipeline Road, Railroad, and Pipeline Crossings (Page 1 of 3)

Alignment Segment	Type of Crossing	Location of Crossing
A0	Road (P-I90, S)	Billings East* — Approximate Mile Post - 450+0.815 (P-I90), T1S, R26E, S2, SE1/4,SE1/4, NW1/4
A0	Road (S-10)	Billings East* — T1S, R26E, S2, SW1/4, NW1/4, SE1/4
A1	Road (S-State Ave.)	Billings East* — T1S, R26E, S2, SW1/4, SW1/4, SE1/4
A1	Road (S)	Soda Springs NW* — T2S, R26E, S1, NW1/4, SE1/4, SW1/4
A1	Road (S)	Soda Springs NW* — T2S, R26E, S11, SW1/4, SE1/4, NW1/4
A1	Road (S-416)	Soda Springs NW* — Approximate Mile Post - 7+0.508 T2S, R26E, S15, NW1/4, SW1/4, NE1/4
A2	Road (S-State Ave.)	Billings East* — T1S, R26E, S2, SW1/4, SW1/4, SE1/4
A2	Road (S)	Billings West* — T1S, R26E, S15, NW1/4, SE1/4,NW1/4
A2	Road (S)	Billings West* — T1S, R26E, S16, NE1/4, SE1/4, NE1/4
A2	Road (S-416)	Yegen* — Approximate Mile Post - 2+0.689 T1S, R26E, S20, SE1/4, SE1/4, SE1/4
A2	Road (S)	Yegen* — T1S, R26E, S33, SW1/4, SW1/4, NW1/4
A2	Road (S)	Yegen* — T2S, R26E, S5, SW1/4, NE1/4, NE1/4
A2	Road (S)	Yegen* — T2S, R26E, S5, NE1/4, NW1/4, SE1/4
A2	Road (S), Pipeline	Yegen* — T2S, R26E, S8, NE1/4, SE1/4, SE1/4
B1	Road (S)	Yegen* — T2S, R26E, S19, NW1/4, SE1/4, NE1/4
B1	Road (S)	Yegen* — T2S, R26E, S20, NW1/4, SE1/4, NW1/4
B1	Road (S)	Mossmain* — T2S, R25E, S22, SW1/4, NW1/4, NW1/4
B1	Road (S)	Mossmain* — T2S, R25E, S21, SW1/4, SW1/4, SW1/4
B1	Road (S)	Mossmain SW* — T2S, R25E, S30, SW1/4, SE1/4, SE1/4

Table B-1. Beartooth Pipeline Road, Railroad, and Pipeline Crossings (Page 2 of 3)

Alignment Segment	Type of Crossing	Location of Crossing
B1	Road (S)	Mossmain SW* — T3S, R24E, S13, SW1/4, NE1/4, NE1/4
B1	Road (S)	Mossmain SW* — T3S, R24E, S25, SE1/4, SE1/4, NW1/4
B2	Road (S)	Mossmain SW* — T3S, R25E, S28, NW1/4, SE1/4, NE1/4
B2	Road (S)	Mossmain SW* — T3S, R25E, S28, SW1/4, SE1/4, SE1/4
B2	Road (S)	Stratford Hill* — T3S, R25E, S1, SE1/4, SW1/4, SW1/4
B2	Road (S)	Stratford Hill* — T3S, R25E, S14, NW1/4, SW1/4, NW1/4
C (ESE)	Road (S)	Pryor NW* — T4S, R24E, S26, SW1/4, SW1/4, NW1/4
C (Conoco)	Road (S)	Pryor NW* — T4S, R24E, S27, NE1/4, SW1/4, NE1/4
C	Road (S)	Edgar* — T4S, R24E, S4, NE1/4, NE1/4, SE1/4
Bluewater	Road (S)	Bluewater* — T6S, R24E, S9, NE1/4, NW1/4, SE1/4
D1	Road (S)	Bowler* — T7S, 24E, S24, SW1/4, SE1/4, SE1/4
D1	Road (S), Pipeline	Bowler* — T8S, R25E, S17, NW1/4, NW1/4, SE1/4
D2	Road (S), Pipeline (2)	Bowler* — T7S, R25E, S29, NE1/4, SE1/4, SW1/4
D2	Pipeline	Bowler* — T7S, R25E, S32, NE1/4, NE1/4, NW1/4
D2	Road (S)	Bowler* — T7S, R25E, S18, SW1/4, SE1/4, SE1/4
D2	Road (S), Pipeline (2)	Bowler* — T8S, R25E, S8, NE1/4, NE1/4, NW1/4
E	Pipeline (2)	Bowler* — T7S, R25E, S18, SW1/4, SE1/4, SE1/4
E	Pipeline	Warren* — T8S, R25E, S17, NW1/4, SE1/4, NE1/4
E	Road (S)	Warren* — T8S, R25E, S29, SW1/4, SE1/4, NE1/4
E	Pipeline	Warren* — T8S, R25E, S29, NW1/4, SW1/4, SE1/4
E	Pipeline	Warren* — T8S, R25E, S29, NW1/4, SE1/4, NE1/4
F1	Road (S)	Warren* — T9S, R25E, S8, NE1/4, NE1/4, NW1/4

Table B-1. Beartooth Pipeline Road, Railroad, and Pipeline Crossings (Page 3 of 3)

Alignment Segment	Type of Crossing	Location of Crossing
F1	Railroad	Warren* — T9S, R25E, S8, SW1/4, NE1/4, NW1/4
F1	Pipeline	Warren* — T9S, R24E, S24, NE1/4, SE1/4, NE1/4
F1	Road (S)	Elk Basin, Wyoming* — T58N, R99W, S35, NW1/4, NW1/4, NE1/4
F1	Road (P-310)	Elk Basin, Wyoming* — Approximate Mile Post - 5+0.985 T57N, R99W, S5, NW1/4, SE1/4, NE1/4
F2	Road (P-310)	Warren* — Approximate Mile Post - 6+0.383 T9S, R25E, S8, NW1/4, SE1/4, NE1/4
F2	Railroad	Warren* — T9S, R25E, S8, NW1/4, NE1/4, SE1/4
F2	Pipeline	Warren* — T9S, R25E, S17, NW1/4, NE1/4, NE1/4
F2	Road (S)	Deaver Reservoir, Wyoming* — T58N, R98W, S31, SE1/4, SE1/4, SE1/4
F2	Road (S-295)	Elk Basin, Wyoming* — T57N, R99W, S5, SE1/4, SE1/4, SE1/4

* Quadrangle
S = secondary road
P = primary road
B1 = roads
B2 = streams
B3 = wetlands

Table B-2. Potential River and Stream Crossings for the Proposed Conoco/Amoco Pipeline Between Billings, Montana and Elk Basin, Wyoming (Page 1 of 5)

Segment	Stream Name	Type*	Mile
A1	Yellowstone River	P	1.56
	Bitter Creek	I	2.13
	Bitter Creek	I	3.65
	Bitter Creek Tributary	I	4.78
	Bitter Creek Tributary	I	5.74
	Blue Creek Tributary	I	7.41
	Blue Creek Tributary	I	7.78
	Blue Creek Tributary	I	8.90
	Blue Creek	P	9.02
	Blue Creek Tributary	I	9.81
A2	Yellowstone River	P	4.05
	Blue Creek	P	4.79
	Blue Creek Tributary	I	6.06
	Blue Creek Tributary	I	7.24
	Blue Creek Tributary	I	7.94
	Basin Creek	I	9.88
B1	East Fork Duck Creek	I	15.83
	Duck Creek	P	18.97
	Spring Creek	I	22.80
	Davis Creek	I	27.02
	Little Cottonwood Creek	I	28.43
	Little Cottonwood Creek Tributary	I	28.78
	Cottonwood Creek Tributary	I	29.88
	Cottonwood Creek Tributary	I	30.21
	Cottonwood Creek Tributary	I	30.32
B2	Blue Creek Tributary	I	9.61
	Davis Creek Tributary	I	12.58
	Davis Creek Tributary	I	13.18

Table B-2. Potential River and Stream Crossings for the Proposed Conoco/Amoco Pipeline Between Billings, Montana and Elk Basin, Wyoming (Page 2 of 5)

Segment	Stream Name	Type*	Mile
C	Cottonwood Creek Tributary	I	30.81
	Cottonwood Creek	I	31.50
	Cottonwood Creek Tributary	I	33.52
	Fivemile Creek Tributary	I	34.38
	Fivemile Creek Tributary	I	34.66
	North Fork Fivemile Creek	P	36.79
	Fivemile Creek Tributary	I	36.99
	Fivemile Creek	P	37.25
D1	Fivemile Creek Tributary	I	41.0
	Fivemile Creek Tributary	I	41.44
	Bluewater Creek Tributary	I	43.25
	Bluewater Creek Tributary	I	44.16
	Bluewater Creek Tributary	I	44.48
	Bluewater Creek Tributary	I	44.72
	Bluewater Creek Tributary	I	45.51
	Bluewater Creek Tributary	I	45.66
	Bluewater Creek	P	47.62
	Bluewater Creek Tributary	I	50.96
	North Fork Bridger Creek	I	54.10
	Sage Creek Tributary	I	54.20
	Sage Creek	P	55.02
	Sage Creek Tributary	I	57.11
	Sage Creek Tributary	I	57.57
D2	Fivemile Creek	P	0.59
	Fivemile Creek Tributary	I	2.14
	Fivemile Creek Tributary	I	2.19
	Fivemile Creek Tributary	I	2.58

Table B-2. Potential River and Stream Crossings for the Proposed Conoco/Amoco Pipeline Between Billings, Montana and Elk Basin, Wyoming (Page 3 of 5)

Segment	Stream Name	Type*	Mile
D2 (cont.)	North Fork Bluewater Creek	I	3.82
	North Fork Bluewater Creek Tributary	I	4.05
	North Fork Bluewater Creek Tributary	I	4.60
	North Fork Bluewater Creek Tributary	I	4.73
	North Fork Bluewater Creek Tributary	I	5.46
	North Fork Bluewater Creek Tributary	I	5.96
	North Fork Bluewater Creek Tributary	I	6.11
	Bluewater Creek	P	7.13
	Bluewater Creek Tributary	I	7.30
	South Fork Bluewater Creek Tributary	I	7.81
	South Fork Bluewater Creek Tributary	I	8.18
	South Fork Bluewater Creek Tributary	I	8.47
	South Fork Bluewater Creek Tributary	I	9.28
	South Fork Bluewater Creek Tributary	I	9.70
	South Fork Bluewater Creek Tributary	I	9.97
	Sage Creek Tributary	I	11.95
	Sage Creek Tributary	I	12.63
	Sage Creek Tributary	I	12.85
	Sage Creek	P	13.23
	Sage Creek Tributary	I	13.35
	Sage Creek Tributary	I	15.46
	Sage Creek Tributary	I	17.04
	Sage Creek Tributary	I	17.30
E	Sage Creek Tributary	I	61.25
	Sage Creek Tributary	I	61.37
	Sage Creek	P	62.36

Table B-2. Potential River and Stream Crossings for the Proposed Conoco/Amoco Pipeline Between Billings, Montana and Elk Basin, Wyoming (Page 4 of 5)

Segment	Stream Name	Type*	Mile
F1	Sage Creek Tributary	I	63.69
	Sage Creek Tributary	I	64.91
	Sage Creek Tributary	I	66.05
	Sage Creek Tributary	I	66.15
	Sage Creek Tributary	I	67.91
	Cottonwood Creek	I	69.47
	Cottonwood Creek Tributary	I	70.08
	Cottonwood Creek Tributary	I	72.08
	Cottonwood Creek Tributary	I	73.30
	Cottonwood Creek Tributary	I	74.33
	Cottonwood Creek Tributary	I	74.47
	Cottonwood Creek Tributary	I	74.70
	Cottonwood Creek Tributary	I	74.94
	Cottonwood Creek Tributary	I	75.12
	Cottonwood Creek Tributary	I	75.65
	Cottonwood Creek Tributary	I	75.92
	Cottonwood Creek Tributary	I	76.84
F2	Sage Creek Tributary	I	1.74
	Sage Creek Tributary	I	2.11
	Sage Creek Tributary	I	2.49
	Sage Creek Tributary	I	2.74
	Sage Creek Tributary	I	3.19
	Sage Creek Tributary	I	3.79
	Sage Creek Tributary	I	4.07
	Sage Creek Tributary	I	4.38
	Sage Creek Tributary	I	5.79
	Sage Creek Tributary	I	8.40

Table B-2. Potential River and Stream Crossings for the Proposed Conoco/Amoco Pipeline Between Billings, Montana and Elk Basin, Wyoming (Page 5 of 5)

Segment	Stream Name	Type*	Mile
	Cottonwood Creek Tributary	I	12.75
	Cottonwood Creek Tributary	I	12.93
	Cottonwood Creek Tributary	I	13.75
	Cottonwood Creek Tributary	I	14.23
	Cottonwood Creek Tributary	I	14.58
	Cottonwood Creek Tributary	I	14.92
	Cottonwood Creek Tributary	I	15.36
	Cottonwood Creek Tributary	I	15.74

* P = Perennial Stream
I = Intermittent Stream

Source: ESE, 1996.

Table B-3. Location of Wetland Crossings

Wetland Type	Route	Station Location	Stream Association	Acres*
Riparian	A_1	5.0	Bitter Creek	0.02
Riparian	A_1	10.0	Blue Creek	0.01
Riparian	A_1	12.1	Big Coulee	0.01
Riparian†	A_2	1	Oxbow Lake created by the Yellowstone River	0.01
Emergent	A_2	3.5	None (Riverfront Park)	0.93
Emergent	A_2	4.2	None	0.02
Emergent	A_2	4.4	None	0.01
Riparian	A_2	4.9	Blue Creek	0.01
Riparian	A_2	8	Basin Creek	0.01
Riparian	B_1	19	Duck Creek	0.01
Riparian	B_1	22.8	Spring Creek	0.01
Riparian	B_1	18.8	East Fork Duck Creek	0.01
Emergent†	B_1	23	None	0.03
Riparian	B_2	4	Tributary to Blue Creek	0.01
Riparian	C	37	North Fork Fivemile Creek	0.01
Riparian	C	37.5	Fivemile Creek	0.09
Riparian	D_1	51.0	North Fork Bridger Creek	0.01
Riparian	D_1	44.4	North Fork Blue Water Creek	0.02
Riparian	D_1	53.5	Sage Creek	0.02
Riparian	D_1	54	Sage Creek	0.03
Riparian	D_1	55	Sage Creek	0.03
Riparian	D_2	13.9	Sage Creek	0.02
Riparian	D_2	2	Fivemile Creek	0.03
Riparian	D_2	6	Bluewater Creek	0.01
Riparian	E	62.3	Sage Creek	0.02
Riparian	F_1	66	Tributary to Sage Creek	0.01
Riparian	F_2	3.8	Tributary to Sage Creek	0.01

* Acreage is estimated.

† Wetland does not occupy the entire 100-foot ROW.

Source: ESE, 1996.

Appendix C

Development of Route Alternates, Beartooth Pipeline

C.1 Development of Route Alternates

C.1.1 Corridor Development

The development of route alternates was initially undertaken by integrating and assimilating environmental and engineering constraint information for broad study corridors. Critical engineering and environmental flaws were highlighted during this process. The result of this analysis was the development of corridors that satisfactorily achieved the objectives of the project (i.e., that of providing a safe, efficient and economic system to transport oil from Billings to the Elk Basin), while avoiding critical environmental flaws.

As is presented in Figure 2-1, lettered corridor segments were developed that, when combined sequentially, comprise alignment corridors. General corridor development included the following primary conceptual considerations:

1. Minimize overall route length by "straightening" the corridor orientation between the project termini; and
2. Minimize disruption to natural and cultural resources by utilizing previously impacted corridors (i.e., roads, interstate highway, pipelines, transmission lines, railroads).

A total of 13 corridor segments were developed which may be divided into three general geographical groups (see Figure 2-1). A central corridor group, consisting of the greatest number of corridor segments, generally extends southeasterly out of the Billings area, passing west of the Crow Indian Reservation but east of I-90 and Route 310 (corridor segments F, E, De, Dw, B, Bf, Bw, Ae, Aw). These segments within the central project area extend south in the vicinity of the Bluewater Fish Hatchery, into the Bowler Flats, and then southwesterly to Elk Basin, Wyoming.

The western corridor generally extends southwesterly out of the Billings area. It utilizes Corridor G and follows I-90 to Laurel, Montana, and then proceeds south along Route 310 and the adjacent railroad, turning southeasterly past Bridger, Montana, joining the central corridor group in the Bowler Flats area.

The eastern corridor extends southeast of Billings along existing pipeline and transmission line corridors into the Crow Indian Reservation along Corridor H. In the vicinity of Pryor Creek Road (BIA Route 5), the corridor extends southwesterly passing through the Pryor Gap to the Bowler Flats area.

C.1.2 Qualitative Evaluation of Preliminary Corridors

In order to evaluate each of these preliminary corridors and reduce the number to a reasonable and manageable number of final study corridors, an alternative evaluation technique was utilized.

This method entailed a consideration of a variety of evaluation criteria that incorporated a consideration of environmental, engineering, and scheduling criteria as well as cost (Table 2-1).

The qualitative analyses of selected corridor segments and the resulting decisions made regarding each segment(s) that was eliminated from further consideration are described below.

Corridor A

Although Segment A represented the most direct corridor in the southern portion of the project area, it was determined to be critically flawed for a number of reasons:

- Reduced level of engineering feasibility and higher costs which is attributable to extreme variation in terrain;
- It crosses Weatherman Gap, a BLM proposed Area of Critical Environmental Concern (ACEC);
- It crosses a greater number of surface water systems as compared to potential routes in Corridor B;
- It did not effectively utilize pre-existing corridors (roads, pipelines, etc.), and therefore had a greater potential for adverse environmental impact in terms of land use and cover type fragmentation, aesthetics and constructability (access); and
- Corridor Aw potentially affects a second BLM ACEC area north of Route 310,

Corridor Bw

This corridor was developed in response to concerns expressed about the potential effects of the proposed route on the Bluewater Fish Hatchery. Potential routes within this corridor will be located downstream of the hatchery, thereby reducing concerns about potential impacts to the hatchery and nearby water sources. This corridor, however, was eliminated for the following reasons:

- Reduced engineering feasibility as a result of extremely rugged terrain; and
- A greater overall project length.

Corridors De, Dw, and Dn

Each of these corridors provided some advantages in terms of their ability to utilize pre-existing corridors. Pre-existing corridors used along these routes included roads such as Duck Creek Road, Metzger Road, and Keller Jellison Road. Each of these corridors were also determined to be feasible in terms of engineering. However, these corridors were eliminated from further consideration, as a result of their greater overall project length (3 to 5 miles) and, therefore, increased project costs.

Corridor G

Corridor G was advantageous since it utilizes pre-existing corridors (roadways, railroads, pipelines) for its entire length. However, it was eliminated from detailed consideration for the following reasons:

- It extends the overall length of the project for 56 miles, thereby increasing construction cost;
- It traverses across designated floodplains for a greater distance, thereby reducing engineering feasibility;
- It crosses the Clark's Fork of the Yellowstone River, thereby representing greater potential impact to surface water resources; and
- Due to its alignment along Route 310, it will likely entail a greater number of road and utility crossings, and it will affect a greater number of parcels. Consequently, it will require more extensive easement negotiations with a greater number of landowners.

Corridor H

Corridor H was advantageous as it followed both existing pipeline corridors and existing roadways (B1A Route 5). However, it was eliminated from detailed consideration due to potentially significant cultural resource impacts attributable to its routing through Pryor Gap (sacred lands) and its extensive length through the Crow Indian Reservation.

Tables

Figures

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Table 1-1. Permit, Approval, and Consultation Requirements for Beartooth Pipeline (Page 1 of 3)

Agency	Permit/Authority	Agency Action
U.S. Government		
Advisory Council on Historic Preservation	Section 106, NHPA (for federal actions)	Provide consultation under Section 106 for all project features that may potentially affect cultural resources that are either eligible for listing or listed in the NRHP.
U.S. Army Corps of Engineers	Section 404 (Clean Water Act) Nationwide permits	Confirm applicability of Section 404 nationwide permits for the placement of dredge or fill material in a water of the U.S. This permit could apply to any physical feature or activity resulting in the placement of fill or dredge material in navigable waters or wetlands.
	Section 10 Permit (Rivers and Harbors Act of 1899)	Consider issuance of Section 10 permits for pipeline crossing of navigable waters (Yellowstone River).
U.S. Bureau of Land Management	ROW Grant and Use Permit under Section 28 (Mineral Leasing Act)	Grant rights-of-way and issue temporary use permits under Section 28 of the Mineral Leasing Act for the portions that would encroach on BLM lands.
	Notice to Proceed	Following issuance of ROW grant, the project applicant must prepare site-specific impact analyses and recommend mitigation measures as necessary (i.e., plans and programs). Once BLM approves the plans and programs, it will issue a notice to proceed with all project development activities. For this pipeline, the BLM would adapt the state EA.
	Antiquities and Cultural Resources Use Permit	Consider issuance of antiquities and cultural resources use permit to excavate or remove cultural resources on federal lands under FLPMA and ARPA, as necessary during site preparation activities.
	Consultation	Approve detailed Construction, Operation, Rehabilitation, and Environmental Protection Plan
U.S. Dept. of Transportation, Federal Highway Administration	Encroachment Permits	Consider issuance of permits for pipeline and access road crossing of federally funded highways.
Environmental Protection Agency	Section 309 (per Clean Air Act) Section 404 and 401 (Clean Water Act)	Review project compliance with Section 309 of the Clean Air Act and Section 404 and 401 of Clean Water Act with regard to pipeline construction and operation activities.
Federal Communications Commission	License for Fixed Microwave Stations and Service	Grant a license to operate industrial radio service for fixed microwave stations and service.
U.S. Fish and Wildlife Service	Section 7, Endangered Species Act (ESA)	Provide biological opinion on federally listed species of wildlife and plants. This act would apply to all project features that may affect federally listed species or their habitats.
Montana		
Dept. of Environmental Quality, Board of Environmental Review	Montana Environmental Policy Act	Review project application, conduct reviews of project impacts, alternatives and mitigation for adverse impacts, and coordinate other permit activities as noted below.

Table 1-1. Permit, Approval, and Consultation Requirements for Beartooth Pipeline (Page 2 of 3)

Agency	Permit/Authority	Agency Action
Montana (cont.)		
Air Quality Division	Air Quality Permit	Consider issuance of air quality construction and operation permits including PSD permits where required for project facilities that would emit air pollutants in certain quantities.
Water Quality Division	Montana Water Quality Act, 3A Authorization	Consider issuance of a 3A Authorization with development conditions designed to maintain water quality standards during construction activities that would affect stream water quality. A 3A Authorization is required only if the 310 stream crossing permit denies a turbidity exemption.
	Section 401 Certification, Clean Water Act	Consider issuance of Clean Water Act, Section 401 certification for all activities that may result in discharge to navigable waters.
	MPDES Permit (authority delegated by EPA from the NPDES	Grant an MPDES permit for hydrostatic testing wastewater discharge (21 days). Grant storm water discharge permit to approve erosion control measures during construction and revegetation under MPDES authority.
Montana Dept. of Transportation	Encroachment permits	Grant state highway encroachments permits for pipeline and access roads that may encroach on state highway rights-of-way. Not needed for common carrier pipelines.
	Environmental Checklist	Review of Environmental Checklist required for indicated crossings. Review occurs simultaneously to any applicable permit submittals; allows permitting process to proceed.
Montana Dept. of Natural Resources and Conservation	Floodplain Development Permit (Floodplain and Floodway Management Act, Title 76, Chap. 5 of Montana Code)	Grant a permit to construct in the 100-year floodplain. DNRC issues permit for those counties without County Floodplain coordinator.
	Easement Grant	Grant ROW easement for crossing state lands and state waters. Water crossing permits not needed for common couriers.
	Land Use License	Grant license for temporary use of state lands and state waters (may be required in addition to ROW easement).
Montana Office of Historic Preservation	Consultation under Section 106, NHPA, Montana Antiquities Act	Consult with project applicants, BLM, USACE, and state agencies regarding impacts on cultural resources that are either listed or eligible for listing on the NRHP.
Montana Boards of County Commissioners for Yellowstone and Carbon Counties	Easement Grants and Road Crossing Permits	Consider issuance of ROW easement grants and road crossing permits for county property and roadways.
Yellowstone and Carbon Conservation Districts (in consultation with MDFWP)	Natural Streambed and Land Preservation Act	Consider issuance of 310 permits for stream crossings and identify turbidity exemptions from the 3A Authorizations for pipeline and maintenance road development that may affect stream corridors.

Table 1-1. Permit, Approval, and Consultation Requirements for Beartooth Pipeline (Page 3 of 3)

Agency	Permit/Authority	Agency Action
Montana (cont.)		
	Surface Water Turbidity Exemption	Grant a short-term exemption (part of the 310 permit for stream crossing) from surface water turbidity standards during construction. If a short-term turbidity exemption is not granted, a 3A Authorization is required to ensure maintenance of water quality.
Carbon and Yellowstone County Weed Boards	Montana Noxious Weed Control Act	Provides for containment, suppression and eradication of noxious weeds along pipeline ROW under approved management plan.
Wyoming		
Wyoming DEQ	Permit	Consider issuance of permit for the creation of a sediment pond for erosion control.
Air Quality Division	Air Quality Permits	Consider issuance of air quality and operation permits, including PSD permits where required for project facilities that would emit air pollutants in certain quantities.
Water Quality Division	NPDES Permit (authorized by federal Clean Water Act)	Consider issuance of an NPDES Permit for point source discharge.
Wyoming Dept. of Transportation	Encroachment Permit	Consider issuance of a license for encroachment on state highways.
Wyoming Office of Historic Preservation	Section 106 NHPA Consultation	Consult with project applicants and BLM regarding impacts on cultural resources that are either listed or eligible for listing in the NRHP.
Wyoming State Land and Farm Loan Office	ROW Grant and Temporary Use Permits	Consider issuance of a grant of ROW across state lands. Consider issuance of temporary use permits for project activities located on state lands outside the pipeline ROW.
Public Service Commission	Administration Role in the Development Process	Oversee engineering, construction, and safety matters.
Wyoming State Engineer's Office	Groundwater Appropriation Permit	Consider issuance of a permit to appropriate groundwater.
	Surface Water Appropriation Permit	Consider issuance of a license to appropriate surface waters.
Wyoming Waste Management Agency	Landfill Permit	Consider issuance of a landfill permit for solid waste disposal.
Wyoming County Commission for Park County	Road Crossing Permits	Consider issuance of a permit for pipeline and access road crossing.
	Development permits	Consider issuance of a permit for project development.
	Oil and Gas Transmission Line Permits (as required)	Consider issuance of permits for project development.
Conservation Districts	Floodplain Permits	Consider issuance of floodplain permits for construction or development activities in 100-year floodplain.

Table 2-1. Typical Construction Equipment - Rural Areas

Equipment Type
Air Compressor
Backhoe
Bending Machine
Boring Machine
Ditcher
Dozer
Flat Bed Truck
Fuel and Service Truck
Hydro Crane
Loader
Low Bed Truck
Motor Patrol
Padding Machine
Passenger Bus
Pickup Truck
Pipe Truck
Side Boom
Skid Truck
Trackhoe
Water Truck
Welding Truck
X-Ray Truck

Table 3-1. Temporary Housing Availability in the Project Area

State	Town/City	Motel and Hotel Units	Trailer and Tent Camping
Montana	Billings	2,949	3,378
	Laurel	102	291
	Columbus	48	91
	Park City	8	24
	Silesia	0	22
	Joliet	4	30
	Fromberg	0	9
	Absarokee	4	28
	Roberts	0	18
	Bridger	8	32
	Belfry	0	0
	Red Lodge	310	210
Wyoming	Lovell	70	191
	Cody	1,389	982
	Powell	140	25

Source: MDEQ, 1996.

Table 3-2. Land Ownership Within the Beartooth Pipeline Study Corridor*

Ownership	Acres	Percent
Private	132,929	85.5
State Land (Montana, Wyoming)	7,811	5.0
Bureau of Land Management	13,949	9.0
Indian Reservation	723	0.5

* Corridor width is approximately 1 mile.

Source: ESE, 1996.

Table 3-3. Land Use of the Beartooth Pipeline Study Corridor*

Land Use	Acres	Percent
Developed		
Residential	1,320	0.8
Commercial and Services	834	0.5
Industrial	370	0.2
Other Developed	546	0.4
Subtotal	3,070	2.0
Agricultural		
Cropland and Pasture	27,079	17.4
Other Agricultural Land	85	0.1
Subtotal	27,164	17.5
Rangeland	116,391	74.9
Forestland	7,833	5.0
Riparian/Wetland	954	0.6
TOTAL	155,412	100.0

* Corridor width is approximately 1 mile.

Source: ESE, 1996.

Table 3-4. Plant Species Observed Within the Land Uses Located along the Proposed Beartooth Pipeline Corridor* (Yellowstone and Carbon Counties, Montana and Park County, Wyoming)

Scientific Name	Common Name	Developed	Recreation	Wetland	Irrigated Cropland	Dry Cropland	Rangeland
Agropyron sp.		O	U	---	U	U	U
Agrostis sp.		U	U	---	---	U	U
Artemisia sp.	Sagebrush	---	---	---	---	R	A
Elymus sp.		O	U	---	---	U	U
Festuca sp.		---	U	---	U	U	U
Juniperus scopulorum	Rocky Mountain Juniper	---	---	---	---	---	R
Opuntia polyacantha	Prickly Pear Cacti	---	---	---	---	R	O
Phelum pratense	Timothy	O	O	---	C	C	U
Poa compressa	Canada Blue grass	O	O	---	U	---	U
Populus sp.	Cottonwood	O	C	C	---	---	---
Tamarix pentandra	Salt Cedar	---	---	R	---	---	---
Typha sp.	Cattail	R	O	C	---	---	---

* Corridor width is approximately 1 mile.

A = Abundant
C = Common
O = Occasional
U = Uncommon
R = Rare
-- = Not observed

Source: ESE, 1996.

Table 3-5. Common Sounds and Corresponding Noise Levels

Common Sounds	Sound Level (dBA)	Loudness
Air Raid Siren	140	Uncomfortable
Subway	100	Very Loud
Gas Lawn Mower at 0.9 m (3 ft)	94	
Food Blender at 0.9 m (3 ft)	88	Loud
Garbage Disposal	80	
Inside an Automobile at 64.4 kmph (40 mph)	75	Moderate
Normal Speech	60	
Automobile at 61 m (200 ft)	55	
Private Office	50	Quiet
Library	35	
Quiet Rural Nighttime	25	Very Quiet
Whisper	20	
Threshold of Hearing	5	Barely Audible

Source: Bell 1973.

Table 3-6. Soil Associations of the Beartooth Pipeline Study Corridor*

Soil Associations	Acres	Percent
Shale and Sandstone Uplands		
Wayden-Cabba-Rentsac	15,950	10.3
Absarokee-Sinnigam	15,465	10.0
Kyle	3,585	2.3
Bainville-Travessilla-Rock Land	4,806	3.1
Midway-Travessilla	8,125	5.2
Pierre-Lismas-Kyle	10,987	7.1
Maginnis-Absarokee	39,566	25.5
Intermediate Terraces and Fans		
Harvey-Stormitt	20,356	13.1
Nunn-Wormser	2,250	1.4
River Terraces, Low Alluvial Fans, and Floodplains		
McRae-Lohmiller-Keiser	1,797	1.2
Haverson	5,193	3.3
Limestone Outcrops and Well-Drained Soils of the Mountains		
Limestone Outcrop-Lap-Windham	5,611	3.6
High Terraces and Benches		
Wanetta-Keiser	738	0.5
Danvers	417	0.3
Wyoming†	20,567	13.2
TOTAL	155,413	100

* Corridor width is approximately 1 mile.

† Soil associations not yet defined for State of Wyoming section.

Source:

Table 3-7. Potential Problematic Soils - Soil Series Which May Exhibit Reclamation Problems Due to Problematic Soil Characteristics, Yellowstone County, Montana (Page 1 of 2)

Soil ID Symbol	Soil Series	Limitation Values*								
		Depth to Bedrock (<20 in.)	Salinity (qualitative)	pH (>8.5)	Slope % (>15)	Clay USDA	Sand % (>85)	Permeability (in/hr)	Surface % St (>75)	Topsoil (qualitative)
Aa	Absarokee clay loam†	20-40	None	7.4-7.8	1-4	Clay†	<20	0.2-0.63	<10	Good
Ab	Absarokee clay loam†	20-40	None	7.4-7.8	1-4	Clay†	<20	0.2-0.63	<10	Good
Al	Alluvial land mixed†				0-5				<>75†	Poor
An	Alluvial land, wet†									
Ao	Amherst clay loam†	10-20†	Moderate	7.4-7.8	7-15	No	<65	0.63-2	<40	Fair
Ap	Amherst - Maginnis clay loams†	10-20†	Moderate	7.4-7.8	7-15	No	<65	0.63-2	<40	Fair
Da	Danvers silty clay loam	>60	None	6.6-8.4	2-4	No	<30	0.2-0.63	<10	Good
Dn	Danvers silty clay loam	>60	None	6.6-8.4	8-15	No	<30	0.2-0.63	<10	Good
Ec	Elso clay loam†	10-20†	None-Low	7.9-8.4	4-7	No	<30	0.63-2	<10	Unsuitable†
El	Elso clay loam†	10-20†	None-Low	7.9-8.4	7-15	No	<30	0.63-2	<10	Unsuitable†
Fa	Farland - Lambert silt loam	>60	None	6.6-8.4	0-4	No	<20	0.63-2	0	Good
Ga	Gilt Edge - Allentine complex†	20-40	None-Mod	6.6-9	2-7	Clay†	<30	0.06-0.63	0	Good
Gt	Grail	>60	None-Low	7.4-8.4	2-15	No	<45	0.06-0.63	0	Fair-Poor
Ha	Haverson loam	>60	Low-Mod	7.9-8.4	0-1	No	<40	0.63-20	0	Good
Hd	Haverson silty clay loam	**	Low-Mod	7.9-8.4	0-1	No	<40	0.63-20	0	Good
He	Haverson silty clay loam	>60	Low-Mod	7.9-8.4	1-3	No	<40	0.63-20	0	Good
Hl	Haverson and Lohmiller	>60	Low-Mod	7.9-8.4	0-4	No	<40	0.63-20	0	Good
Hn	Haverson loam	>60	None-Low	7.9-8.4	0-1	No	<40	0.63-20	0	Good
Ht	Hopley loam	>60	None	6.6-8.4	4-7	No	<45	0.63-2	0	Good
Hw	Hydro - Arvada clay loam†	>60	None-Low	7.4-9	0-2	Clay†	<30	0.06-0.63	0	Fair

Table 3-7. Potential Problematic Soils - Soil Series Which May Exhibit Reclamation Problems Due to Problematic Soil Characteristics, Yellowstone County, Montana (Page 2 of 2)

Soil ID Symbol	Soil Series	Limitation Values*								
		Depth to Bedrock (<20 in.)	Salinity (qualitative)	pH (>8.5)	Slope % (>15)	Clay USDA	Sand % (>85)	Permeability (in/hr)	Surface % St (>75)	Topsoil (qualitative)
Lc	Lambert silt loam,	>60	Low-Mod	7.9-8.4	7-15	No	<20	0.2-0.63	0	Good
Ln	Lismas clay†	10-20†	None	7.4-8.4	15-35	Clay†	<20	0.06-0.2	0	Unsuitable†
Lo	Lohmiller silty clay loam†	>60	None-High	7.9-9†	3-7	Clay†	<60	0.2-6.3	0	Good-Fair
Lr	Lohmiller silty clay†	>60	None-High	7.9-9†	0-1	Clay†	<60	0.2-6.3	0	Good-Fair
Ls	Lohmiller†	>60	None-High	7.9-9†	0-2	Clay†	<60	0.2-6.3	0	Good-Fair
Ma	Maginnis channery clay loam†	4-15†	None	6.1-6.5	7-15	No	<50	0.22-0.63	<75	Unsuitable†
Mc	Maginnis channery clay loam†	4-15†	None	6.1-6.5	15-35	No	<50	0.22-0.63	<75	Unsuitable†
Mg	Maginnis - Rock outcrop†	4-15†	None	6.1-6.5	35-60	No	<50	0.22-0.63	<75	Unsuitable†
Ms	McRae - Baineville loams	48-76	None	7.9-8.4	7-15	No	<40	0.63-2	0	
Pc	Pierre clay†	20-40	Low-Mod	7.9-8.4	4-7	Clay†	<15	0.06-0.2	<5	Unsuitable†
Pl	Pierre - Lismas clays†	20-40	Low-Mod	7.9-8.4	7-15	Clay†	<15	0.06-0.2	<5	Unsuitable†
Re	Riverwash†								<>75†	Unsuitable†

* Limitation values are defined as those soil characteristics that may prove to be unsuitable for reclamation, difficult to reclaim, or may require specific mitigation measures.

† Soil series that are characterized by certain qualitities that may limit reclamation potential, and those characteristics identified as potentially limiting.

** Potentially problematic soils - Soils which may be difficult to reclaim in Yellowstone County.

Source: USDA-NRSC, 1972.

Table 3-8. Potential Problematic Soils - Soil Series Which May Exhibit Reclamation Problems Due to Problematic Soil Characteristics, Carbon County, Montana (Page 1 of 3)

Soil ID Symbol	Soil Series	Limitation Values*							
		Depth to Bedrock (<20 in.)	pH (>8.5)	Slope % (>15)	Clay % >40	Sand % (>85)	Permeability (in/hr)	Surface % St (>75)	Topsoil (qualitative)
AA	Abac-Twin Creek complex†	<20†	7.4-9	Steep	No	>35	0.6-2	<35	Poor
Ad	Absarokee clay loam†	35-40	6.6-8.4	4-8	Clay†	<25	0.6-2	<20	Poor
Ae	Absarokee clay loam†	35-40	6.6-8.4	8-15	Clay†	<25	0.6-2	<20	Poor
Ah	Absarokee-Shane clay loams†	35-40	6.6-8.4	6-15	Clay†	<25	0.2-2	<20	Poor
Ak	Absarokee-Sinnigam clay loams†	35-40	6.1-8.4	4-8	Clay†	<25	0.2-2	<20	Poor
Am	Absarokee-Sinnigam clay loams†	35-40	6.1-8.4	8-15	Clay†	<25	0.2-2	<20	Poor
As	Alice fine sandy loam	>40	6.6-7.6	8-15	No	<65	2-6	0	Fair
At	Alletine clay loam†	>60	7.9-9	2-4	Clay†	<30	<0.06	0	Poor
BT	Bowbac-Torchlight association	>60	7.4-8.4	Undulating	No	30	0.06-2	0	Fair-Poor
Bb	Bowbac loam	>60	7.4-8.4	2-4	No	30	0.6-2	0	Fair
Bc	Bowbac loam	>60	7.4-8.4	4-8	No	30	0.6-2	0	Fair
Cg	Colby silt loam	>60	7.9-8.4	4-8	No	30	0.6-2	0	Good
Hg	Harvey loam	>60	7.9-8.4	4-8	No	<40	0.6-2	<5	Good
Hn	Haverson-Heldt silty clay loams†	>60	7.9-8.4	0-4	No	<50	0.06-2	0	Fair
Ht	Heldt silty clay loam†	>60	7.4-9	2-4	No	<30	0.06-0.2	0	Fair
Hw	Heldt silty clay loam, saline†	>60	7.4-9	0-6	No	<30	0.06-0.2	0	Poor
Kc	Kyle clay†	>60	7.4-9	0-2	Clay†	<10	<0.06	0	Poor
Ke	Kyle clay†	>60	7.4-9	4-8	Clay†	<10	<0.06	0	Poor
LE	Lap-Rock outcrop association†	<20†	7.4-8.4	Mod steep	No	<33	0.6-2	<85†	Poor
LO	Lismas clay†	>20†	>9	Hilly	No	20	<0.06	0	Poor
La	La Fonda loam	>60	7.4-8.4	0-2	No	<50	0.6-2	<10	Fair

Table 3-8. Potential Problematic Soils - Soil Series Which May Exhibit Reclamation Problems Due to Problematic Soil Characteristics, Carbon County, Montana (Page 2 of 3)

Soil ID Symbol	Soil Series	Limitation Values*							
		Depth to Bedrock (<20 in.)	pH (>8.5)	Slope % (>15)	Clay % >40	Sand % (>85)	Permeability (in/hr)	Surface % St (>75)	Topsoil (qualitative)
Lb	La Fonda loam	>60	7.4-8.4	2-4	No	<50	0.6-2	<10	Fair
Lc	Lambeth silt loam	>40	7.4-8.4	4-8	No	<20	0.06-0.2	0	Good
Mc	Marias clay†	>60	7.9-9	2-8	Clay†	<15	<0.06	0	Poor
Md	Marias clay†	>60	7.9-9	8-15	Clay†	<15	<0.06	0	Poor
Mf	Martinsdale clay loam	>60	6.6-8.4	2-4	No	<40	0.6-2	<10	Fair
Mg	Martinsdale clay loam	>60	6.6-8.4	4-8	No	<40	0.6-2	<10	Fair
Mo	McRae loam†	>60	7.4-9	2-4	No	<40	0.6-2	0	Good
NH	Nihill very gravelly loam†	>60	7.4-9	Mod steep	No	<40	2-6	0	Poor
Ne	Nelson fine sandy loam	29-39	7.4-7.8	4-8	No	<65	2-6	0	Fair
Nf	Neville silty clay loam†	>60	7.9-9	2-4	No	<15	0.6-2	0	Fair
Ng	Neville silty clay loam†	>60	7.9-9	4-8	No	<15	0.6-2	0	Fair
Nk	Nunn silty clay loam†	>60	6.6-9	0-2	No	<30	0.2-0.6	0	Fair
Nn	Nunn silty clay loam†	>60	6.6-9	4-8	No	<30	0.2-0.6	0	Fair
Pe	Peritsa silt loam†	20-40	6.6-9	4-8	No	<20	0.6-2	0	Fair
RE	Reeder-Castner association	30-40	6.1-8.4	Rolling	No	<30	0.6-6	0	Poor-Fair
RF	Rentsac channery loam	<20	7.9-8.4	Sloping	No	<35	2-6	<75	Poor
RG	Rentsac-Rock outcrop complex	<20	7.9-8.4	Steep	No	<35	2-6	<75	Poor
Rk	Rock outcrop-Lambeth complex†	0†	7.4-8.4	5-15	NI**	NI	0.06-0.2	NI	Good
RM	Rock outcrop-Travessilla complex†	0†	NI	Step	NI	NI	6-20	NI	Poor
Rt	Rottulee silt loam†	22-35	7.9-9	4-8	No	<40	0.6-2	<5	Poor
SA	Sandstone outcrop†	0†	NVE	--	No	<35	NVE‡	<50	Unsuitable†

Table 3-8. Potential Problematic Soils - Soil Series Which May Exhibit Reclamation Problems Due to Problematic Soil Characteristics, Carbon County, Montana (Page 3 of 3)

Soil ID Symbol	Soil Series	Limitation Values*							
		Depth to Bedrock (<20 in.)	pH (>8.5)	Slope % (>15)	Clay % >40	Sand % (>85)	Permeability (in/hr)	Surface % St (>75)	Topsoil (qualitative)
SC	Shale outcrop†	0†	NVE	--	Clay†	<30	NVE	0	Unsuitable†
SD	Shale outcrop-Abac complex†	0†	NI	Very steep	Clay†	<30	0.6-2	0	Poor
SM	Sinnigam channery clay loam†	8-20†	6.1-7.8	Sloping	No	<45	0.2-0.6	<55	Poor
SN	Sinnigam channery clay loam†	8-20†	6.1-7.8	Mod steep	No	<45	0.2-0.6	<55	Poor
Sp	Stormitt loam†	>60	7.9-9	2-4	No	<55	0.6-2	<60	Poor
Sr	Stormitt gravelly loam†	>60	7.9-9	4-8	No	<55	0.6-2	<60	Poor
St	Stormitt stony loam†	>60	7.9-9	0-8	No	<55	0.6-2	<60	Poor
Tp	Toluca clay loam†	>60	6.6-9	2-4	No	<30	0.6-2	0	Fair
Te	Thedalund clay loam†	20-40	7.9-9	4-8	No	<25	0.6-2	0	Fair
Tf	Thedalund clay loam†	20-40	7.9-9	8-15	No	<25	0.6-2	0	Fair
TW	Torchlight clay†	>60	8.5->9	Sloping	Clay†	<20	0.06-0.2	0	Poor
TY	Travessilla silt loam†	<20†	6.6-9	Sloping	No	<50	6-20	<45	Poor
Tz	Twin Creek silty clay loam	>48	6.6-7.3	4-8	No	<60	0.6-2	<10	Poor
WA	Wayden-Cabba association	<20†	7.4-9	Hilly	No	<30	0.06-0.6	0	Poor
WC	Wayden-Cabba association	<20†	7.4-9	Steep	No	<30	0.06-0.6	0	Poor

* Limitation values are defined as those soil characteristics that may prove to be unsuitable for reclamation, difficult to reclaim, or may require specific mitigation measures.

† Soil series that are characterized by certain qualitities that may limit reclamation potential, and those characteristics identified as potentially limiting.

** NI = no information

† NVE = no valid estimate.

Source: USDA-NRSC, 1972.

Table 3-9. Potential Problematic Soils - Soil Series Which May Exhibit Reclamation Problems Due to Problematic Soil Characteristics, Park County, Wyoming

Soil ID Symbol	Soil Series	Limitation Values*							
		EC (mmhos/cm)	SAR (>8)	pH (>8.5)	Slope % (>15)	Clay >40	Sand % (>85)	Surface % St (>75)	Soil Depth <20 in
Route Segment F_1 West									
37AD	Kishona Loam	0-8	5-13†	7.4-9†	0-15	10-35	<45	0	>60
96	Bowbac fine sandy loam†	0-2	--	6.6-8.4	2-15	10-35	<65	0	20-40
293	Olney-Bowbac complex	0-2	--	6.6-8.4	0-15	10-35	<80	0	20-60
340	Winnett-Arvada-Ulm loam†s	0-16†	--	6.6-9.6†	0-10	15-60†	<30	0	20-60
396	Tassel-Worland-Variant-Rock Outcrop complex†	--	--	7.4-8.4	0-45†	5-18	<75	0	0-40†
Route Segment F_2 East									
18A	Spomer fine sandy loam†	0-2	--	6.6-9†	0-3	0-35	<80	0-5	>60
53	Bessler-Asherton fine sandy loams†	0-4	0-4	6.6-9†	0-10	0-20	<70	0-1	>60
213A	Kamm loam	--	--	7.4-8.4	0-3	0-35	<65	0-20	>60
215A	Clapper - Luhon variants	2-8	0-12	7.4-9	0-30	0-27	<65	0-5	>60
340	Winnett-Arvada-Ulm loams†	0-16†	--	6.6-9.6†	0-10	15-60†	<30	0	20-60
377	Midway-Shingle-Rock Outcrop complex†	0-8	--	6.6-9†	2-60†	20-45†	<70	0	6-20†
382	Worland Variant-Tassel complex†	--	--	7.4-8.4	2-30†	5-35	<75	0	6-20†
393	Olney-Worland Variant sandy loams†	0-2	--	6.6-8.4	0-12	10-53†	<80	0	20-60
415	Larim-Wapiti-Rock Outcrop complex†	0-2	--	6.1-9†	0-90†	0-35	<35	0	>60
469	Keyner-Bowbac-Muffler complex†	0-8	0-30†	6.6-9.6†	0-10	5-35	<75	0	20-60

* Limitation values are defined as those soil characteristics that may prove to be unsuitable for reclamation, difficult to reclaim, or may require specific mitigation measures.

† Soil series that are characterized by certain qualitities that may limit reclamation potential, and those characteristics identified as potentially limiting.

Source: USDA-NRSC, 1972.

Table 3-10. State Species of Special Concern and Federal Listed Species within the Beartooth Project Corridor (Page 1 of 2)

	Common Name	Scientific Name	Federal Status	State Rank
Fauna				
Birds	Burrowing Owl	*Speotyto cunicularia*	C2	S3B, SZN
	Mountain Plover	*Charadrius montanus*	C1	S2B, SZN
	Loggerhead Shrike	*Lanius ludovicianus*		
	Bald Eagle	*Haliaeetus leucocephalus*	T	S3B, S3N
	Peregrine Falcon	*Falco peregrinus*	E	S1S2B
Mammals	Black-footed Ferret	*Mustela nigripes*	E	SH#
	White-tailed Prairie Dog	*Cynomys leucurus*		S2
	Black-tailed Prairie Dog	*Cynomys ludovicianus*		S2
	Spotted Skunk	*Spilogale putorius*	C2NL	SU
	Preble's Shrew	*Sorex preblei*	C2	S3
	Dwarf Shrew	*Sorex nanus*		S3
	Merriam's shrew	*Sorex merriami*		S3
	Fringed Myotis	*Myotis thysanodes*	C2	S3
	Spotted Bat	*Euderma maculatum*	C2	S1
	Townsend's Big-eared Bat	*Plecotus townsendii*	C2	S2
	Small-footed Myotis	*Myotis leibii*		S2
	Long-eared myotis	*Myotis evotis*	C2	S4
	Long-legged myotis	*Myotis volans*	C2	S4
	Yuma Myotis	*Myotis yumanensis*	C2	S3
	Pallid Bat	*Antrozous pallidus*		S1
Reptiles	Short-horned Lizard	*Phrynosoma douglassii*	C2NL	S4
	Sagebrush Lizard	*Sceloporus graciosus*	C2	S3
	Milk Snake	*Lampropeltis triangulum*		S1

Table 3-10. State Species of Special Concern and Federal Listed Species within the Beartooth Project Corridor (Page 2 of 2)

	Common Name	Scientific Name	Federal Status	State Rank
Flora	Gray's Milkvetch	*Astragalus grayi*		S1
	Geyer Milkvetch	*Astragalus geyeri*		S2
	Parrot-head Indian Paintbrush	*Castilleja pilosa var. longispica*		S1
	Giant Helleborine	*Epipactis gigantea*		S2
	Rabbit Buckwheat	*Eriogonum lagopus*	C2	S3
	Joe-pye Weed	*Eupatorium maculatum var. bruneri*		S1
	Beaked Spikerush	*Eleocharis rostellata*		S2
	Swamp Milkweed	*Asclepias incarnata*		S1

E = endangered
C1 = candidate species
C2 = candidate species
NL = no designation
SU = status undetermined
S1 = critically imperiled because of extreme rarity
S2 = imperiled because of rarity
S3 = either very rare and local throughout its range
S4 = apparently secure, rare in parts of range
B = breeding status
N = non-breeding status
Z = ranking not applicable
SH# = species reintroduced, but not breeding and established

Source: NRIS, 1996

Table 3-11. List of Cultural Resource Sites in the vicinity of the Beartooth Pipeline Project (Page 1 of 5)

Site Number	Route Segment	On Line	Contents	National Register Eligibility
24CB0133	F2	no	Historic debris scatter	Unknown
24CB0135	F1	yes	Homestead	Recommended as potentially eligible by consultant
24CB0417	C	no	Petroglyphs	Unknown
24CB0454	D1	?no	Tipi rings	Unknown
24CB0455	D1	?no	Lithics	Unknown
24CB1242	D1, D2	yes	Bridger Cut-Off of Bozeman Trail	Recommended eligible by BLM
24CB1265	D2	yes	Tipe rings	Ineligible
24CB1268	D2	yes?	Lithics	Eligible
24CB1269	D2	no	Lithics, cairns	Recommended as ineligible by consultant
24CB1272	D2	no	Road, root cellar, historic debris	Recommended as ineligible by consultant
24CB1276	D1	no	Lithics, burials, Medicine Wheel	Recommended as eligible by BLM
24CB1280	D2	yes	Historic dugouts	Ineligible
24CB1281	D2	yes	Lyle homestead	Eligible
24CB1282	D2	no	Cairn	Recommended as ineligible by consultant
24CB1284	F1, F2	yes	CB&Q (Fromberg to Warren)	Recommended as eligible by consultant
24CB1285	D2	yes	Pryor Creek/Touca-Cody Branch CB&Q RR	Recommended as ineligible by consultant
24CB1301	F1, F2	no	Historic debris scatter	Recommended as ineligible by consultant
24CB1302	F1	yes	Historic debris scatter	Recommended as ineligible by consultant
24YL0001	A1	no	Pictograph Cave	National Historic Landmark
24YL0002	A1	no	Ghost Cave	National Historic Landmark
24YL0449	A1	no	Bison Kill	Unknown

Table 3-11. List of Cultural Resource Sites in the vicinity of the Beartooth Pipeline Project (Page 2 of 5)

Site Number	Route Segment	On Line	Contents	National Register Eligibility
24YL0659	A1	no	Suburban Ditch	Unknown
24YL1331	A1	no	Bison Kill and Processing Site	Unknown
48PA0138	F2	no	Lithics	Unknown
48PA0139	F2	yes	Lithics	Unknown
48PA0140	F2	no	Lithics	Unknown
48PA0141	F2	no	Lithics	Unknown
48PA0142	F2	no	Lithics	Unknown
48PA0143	F2	yes	Lithics	Unknown
48PA0144	F2	yes	Lithics	Unknown
48PA0145	F2	yes	Lithics	Unknown
48PA0146	F2	yes	Lithics	Unknown
48PA0147	F2	no	Lithics	Unknown
48PA0155	F1, F2	no	Lithics	Unknown
48PA0175	F1, F2	no	Lithics	Unknown
48PA0194	F1, F2	no	Lithics	Unknown
48PA0278	F1	no	Hearth, firepit, FCR, charcoal, lithics	Unknown
48PA0380	F2	yes?	Tipe ring, lithics	Unknown
48PA0432	F1	yes	Ground stone	Unknown
48PA0442	F1, F2	no	Lithics, hearth, possible alignment	Unknown
48PA0443	F1, F2	no	Ground stone, lithics	Recommended as ineligible by consultant
48PA0444	F1, F2	no	Lithics, hearth, FCR, charcoal	Unknown

Table 3-11. List of Cultural Resource Sites in the vicinity of the Beartooth Pipeline Project (Page 3 of 5)

Site Number	Route Segment	On Line	Contents	National Register Eligibility
48PA0445	F1, F2	no	Lithics	Unknown
48PA0446	F2	yes	Rock alighment, ?Medicine Wheel, lithics	Unknown
48PA0447	F1, F2	no	Tipi ring lithics	Eligible
48PA0448	F2	yes?	Hearth, firepit, FCR, charcoal	Unknown
48PA0449	F1, F2	no	Hearth, firepit, FCR, charcoal	Unknown
48PA0450	F1, F2	no	Hearth, firepit, FCR, charcoal, lithics	Recommended as ineligible by consultant
48PA0451	F2	yes	Hearth, firepit, FCR, lithics	Unknown
48PA0452	F1, F2	no	Fire hearths, FCr	Recommended as ineligible by consultant
48PA0453	F2	yes?	Lithics	Unknown
48PA0456	F1, F2	no	Lithics	Unknown
48PA0457	F2	yes?	Lithics	Unknown
48PA0458	F1	yes?	Hearth, firepit, FCR, charcoal, lithics	Unknown
48PA0459	F1	no	Hearth, firepit, FCR, charcoal, lithics	Unknown
48PA0460	F1	no	Hearth, firepit, FCR, charcoal, lithics	Unknown
48PA0461	F1	no	Lithics	Unknown
48PA0462	F1	no	Lithics	Unknown
48PA0464	F2	no	Hearth, firepit, FCR, charcoal, lithics	Recommended as ineligible by consultant
48PA0466	F2	yes?	Ceramics, ground stone, lithics	Unknown
48PA0467	F2	no	Lithics	Unknown
48PA0468	F2	no	Lithics	Recommended as ineligible by consultant
48PA0474	F1	yes?	Historic dump	Recommended as ineligible by consultant

Table 3-11. List of Cultural Resource Sites in the vicinity of the Beartooth Pipeline Project (Page 4 of 5)

Site Number	Route Segment	On Line	Contents	National Register Eligibility
48PA0503	F1, F2	no	Lithics	Recommended as ineligible by consultant
48PA0504	F1, F2	no	Lithics	Recommended as eligible by consultant
48PA0505	F1, F2	no	Lithics	Recommended as ineligible by consultant
48PA0953	F1	no	Fire hearths, FCR, artifacts	Unknown
48PA1026	F1, F2	no	Fire hearths, FCR	Unknown
48PA1755	F2	no	Fire hearths, FCR	Recommended as ineligible by consultant
On Line Unrecorded Historic Properties				
	A1	yes	Yegen Drain	Unknown
	A1	yes	Coulson city Dump	Unknown
	A1	yes	Grey Eagle Ditch	Unknown
	A1	yes	Coburn Road	Unknown
	A1	yes	Coulson Road	Unknown
	A1	yes?	Clark Cabin	Unknown
	A1	yes	Four unnamed historic roads	Unknown
	A2	yes	Yegen Drain	Unknown
	A2	yes	Coulson Road	Unknown
	A2	yes	Grey Eagle Ditch	Unknown
	A2	yes?	Clark Cabin	Unknown
	A2	yes	Five unnamed historic roads	Unknown
	B1	yes	Five unnamed historic roads	Unknown

Table 3-11. List of Cultural Resource Sites in the vicinity of the Beartooth Pipeline Project (Page 5 of 5)

Site Number	Route Segment	On Line	Contents	National Register Eligibility
	B2	yes	Thirteen unnamed historic roads	Unknown
	B2	yes?	Monumental historic cairn	Unknown
	C	yes	Bozeman Trail	Unknown
	D1	yes	Unnamed historic irrigation ditch	Unknown
	D1	yes	Bridger Cut-Off Bozeman Trail (24CB1242)	Crossed in six locations, unknown eligibility
	D1	yes	Bridger Road	Unknown
	D1	yes	Big Horn Basin Wagon Road	Unknown
	D1	yes	Thirteen unnamed historic roads	Unknown
I	D2	yes	Bridger Cut-Off of Bozeman Trail (24CB1242)	Crossed in one location, unknown eligibility
	D2	yes	Big Horn Basin Wagon Road	Unknown
	D2	yes	Bluewater to Sage Creek Road	Unknown
	D2	yes	Bridger to Bowler Road	Unknown
	D2	yes	Two unnamed historic roads	Unknown
	E	yes	Big Horn Basin Road	Unknown

Source: Ethnoscience, 1996.

Table 4-1. Work Force Composition for the Construction of the Beartooth Pipeline

Occupation	Estimated Number per Occupation	Estimated Percentage of Facility Construction Work Force
Construction Superintendent	1	0.7
Foreman	12	9.0
Operator	33	24.2
Welder	14	10.3
Welder's Helper	14	10.3
Laborer	45	33.1
Leadman/Driver/Lineup Lead	10	7.4
Electrician	2	1.4
Electrician's Helper	3	2.2
Mechanic	2	1.4
Total	136	100

Table 4-2. Land Ownership Impacts (Acres) Associated with the Proposed Alignment Alternatives

		Route Realignments									
		Billings Blvd Realignment		Blue Creek Realignment		Bluewater Creek Realignment		Express Realignment		Polecat Bench Realignment	
Land Ownership Category	Proposed Route	Proposed (A_1)	Realignment (A_2)	Proposed (B_1)	Realignment (B_2)	Proposed	Realignment	Proposed (D_1)	Realignment (D_2)	Proposed (F_1)†	Realignment (F_2)†
Private	665.7	111.4	93.3	141.2	140.1	26.1	18.3	159.0	130.2	134.1	138.6
State Land	13.8	4.9			6.8		4.5	8.9	9.4		
BLM Land	6.5				4.6		3.9	1.0	13.6	1.4	6.5
TOTAL	686.0	116.3	93.3	141.2	151.5	26.1	26.7	168.9	153.2	135.5	145.1

Source: ESE, 1996

Table 4-3. Land Use Impacts (Acres) with Each Beartooth Pipeline Route Alternate

		Route Alternates									
		Billings Boulevard		Blue Creek		Bluewater Creek		Express		Polecat Bench	
Land Use Category	Proposed Route*	Proposed (A_1)	Alternate (A_2)	Proposed (B_1)	Alternate (B_2)	Proposed	Alternate	Proposed (D_1)	Alternate (D_2)	Proposed (F_1)	Alternate (F_2)
Developed											
Residential	0.4		3.4								
Industrial	4.3										
Other	3.3										
Subtotal	8.0										
Agricultural											
Irrigated Cropland	36.9			36.9							
Dry-Cropland/ Pasture	95.7	21.0	46.5	19.6	75.6	4.4		30.2	50.3		
Rangeland	532.7	93.1	29.9	84.7	76.0	21.8	26.6	133.2	99.2	135.6	145.1
Forestland	7.9	2.3	5.3					5.6	3.7		
Riparian/ Wetland	0.27	0.04		0.06	0.01	0.07	0.03	0.11	0.06	0.01	0.01

* Proposed route totals represent segments C and E for which alternate route segments were not developed. The segments C and E are common to any potential route alternatives.

Source: ESE, 1996.

Table 4-4. Road, Railroad and Pipeline Crossings Associated with the Proposed Route and Each Route Alternate

	Primary Road	Secondary Road	Pipeline	Railroad	Total
Proposed Route	2	20	7	3	32
Route Alternatives					
Billings Boulevard					
Proposed Route (A_1)	--	4	--	--	4
Alternate (A_2)	--	8	1	--	9
Blue Creek					
Proposed Route (B_1)	--	7	--	--	7
Alternate (B_2)	--	4	--	--	4
Bluewater Creek					
Proposed Route	--	1	--	--	1
Alternate	--	1	--	--	1
Express					
Proposed Route (D_1)	--	2	1	--	3
Alternate (D_2)	--	3	5	--	8
Polecat Bench					
Proposed Route (F_1)	1	2	1	1	5
Alternate (F_2)	1	2	1	1	5

Source: ESE, 1996.

Table 4-5. Length (Miles) Along Roads and Pipelines of the Proposed Route and Each Route Alternate

	Length Along Roads	Length Along Pipelines	Total Length
Proposed Route	13.9	2.1	16.0
Route Realignment			
Billings Boulevard			
Proposed Route (A_1)	2.6	2.1	4.7
Alternate (A_2)	3.6	4.3	7.9
Blue Creek			
Proposed Route (B_1)	0.2	--	0.2
Alternate (B_2)	10.5	--	10.5
Bluewater Creek			
Proposed Route	--	--	--
Alternate	--	--	--
Express			
Proposed Route (D_1)	3.7	--	3.7
Alternate (D_2)	1.5	6.5	8.0
Polecat Bench			
Proposed Route (F_1)	2.6	--	2.6
Alternate (F_2)	--	11.4	11.4

Source: ESE, 1996.

Table 4-6. Soil Associations (Acres) Associated with the Proposed Alignment Alternatives (Page 1 of 2)

Soil Association Category	Proposed Route	Route Alternates									
		Billings Boulevard		Blue Creek		Bluewater Creek		Express		Polecat Bench	
		Proposed (A_1)	Alternate (A_2)	Proposed (B_1)	Alternate (B_2)	Proposed	Alternate	Proposed (D_1)	Alternate (D_2)	Proposed (F_1)	Alternate (F_2)
Shale and Sandstone Uplands											
Bainville-Travessilla-Rock Land	40.0	40.0									
Pierre-Lismas-Kyle	21.7	34.8	5.0	15.6	18.6						
Maginnis-Absarokee	153.8	34.6	46.4	119.1	119.2						
Kyle	23.2			6.5	13.8						
Absarokee-Sinnigam	96.4					3.7	4.8	27.3	30.0		
Wayden-Cabba-Rentsac	73.8					7.2	12.0	73.8	56.8		
Midway-Travessilla	35.9									35.9	36.4
Subtotal	444.8	109.4	51.4	141.2	151.6	10.9	16.8	101.1	86.8	35.9	36.4
Intermediate Terraces and Fans											
Harvey-Stormitt	108.6							49.9	54.3	34.4	26.2
Nunn-Wormser	17.9					15.3	9.9	17.9			
Subtotal	126.5					15.3	9.9	67.8	54.3	34.4	26.2

Table 4-6. Soil Associations (Acres) Associated with the Proposed Alignment Alternatives (Page 2 of 2)

Soil Association Category	Proposed Route	Route Alternates									
		Billings Boulevard		Blue Creek		Bluewater Creek		Express		Polecat Bench	
		Proposed (A_1)	Alternate (A_2)	Proposed (B_1)	Alternate (B_2)	Proposed	Alternate	Proposed (D_1)	Alternate (D_2)	Proposed (F_1)	Alternate (F_2)
River Terraces, Low Alluvial Fans and Floodplains											
Haverson	16.7	6.9	41.9								
Limestone Outcrops											
Lap-Windham									12.1		
Wyoming†	60.7									65.2	82.5

† Soil associations not yet incorporated for state of Wyoming section.

Source:

Table 4-7. Lengths and Areas of Potential Problematic Soils Associated with the Proposed Route and Each Route Alternate

	Problematic Soil Length (feet)	Problematic Soil Length (miles)	Segment Length (miles)	Segment Ratio Problematic/ Total Length	Problematic Soil Area (Acres)
A_0	1100	0.2	1.11	0.19	0.20
A_1	36570	6.9	14.68	0.48	6.72
A_2	35000	6.6	10.66	0.62	6.43
B_1	49870	9.4	16.1	0.59	9.16
B_2	73000	13.8	15.28	0.90	13.41
C	48000	9.1	9.78	0.93	8.82
D_1 (West)	54200	10.3	19.3	0.53	9.96
D_1 (East)	53800	10.2	19.36	0.53	9.88
D_2	32000	6.1	17.47	0.35	5.88
Bluewater Segment West (D_1)	13000	2.5			2.39
Bluewater Segment East (D_1)	12600	2.4			2.31
E	10600	2.0	2.8	0.72	1.95
F_1	47783	9.0	15.54	0.58	8.78
F_2	64373	12.2	16.56	0.74	11.82

Source: ESE, 1996.

Table 4-8. Stream Crossings Associated with the Proposed Route and Each Route Alternate

	Perennial Crossings	Intermittent Crossings	Total Crossings
Proposed Route	8	54	62
Route Alternate			
Billings Boulevard			
Proposed Route (A_1)	2	8	10
Alternate (A_2)	2	4	6
Blue Creek			
Proposed Route (B_1)	1	8	9
Alternate(B_2)	0	3	3
Bluewater Creek			
Proposed Route	3	5	8
Alternate	1	4	5
Express			
Proposed Route (D_1)	2	13	15
Alternate (D_2)	3	24	27
Polecat Bench			
Proposed Route (F_1)	0	17	17
Alternate (F_2)	0	18	18

Source: ESE, 1996.

Table 4-9. Floodplain Distances Associated with Each Beartooth Pipeline Route Alternate

Stream/River System	Segment	Alternate Name	Distance through Floodplain (ft)
Yellowstone River	A_1	Proposed Route	2,000
Blue Creek	A_1	Proposed Route	200
Yellowstone River	A_2	Billings Boulevard	4,200
Duck Creek	B_1	Proposed Route	200
East Fork of Duck Creek	B_1	Proposed Route	350
Cottonwood Creek	C	Proposed Route	200
North Fork of Fivemile Creek	C	Proposed Route	200
Sage Creek	D_1	Proposed Route	1,300
Sage Creek	D_2	Express	200
Sage Creek	E	Proposed Route	800

Source: ESE, 1996.

Table 4-10. Wetland Impacts (Acres) Associated with Each Route Alternate

	Wetland Type		
	Palustine Emergent	Riverine	Total
Proposed Route	0.03	0.24	0.22
Route Alternates			
Billings Boulevard			
Proposed Route (A_1)	--	0.04	0.04
Alternate (A_2)	0.96	0.03	0.99
Blue Creek			
Proposed Route (B_1)	0.03	0.03	0.06
Alternate (B_2)	--	0.01	0.01
Bluewater Creek			
Proposed Route (D_{1c})	--	0.07	0.07
Alternate (D_{1A})	--	0.03	0.03
Express			
Proposed Route (D_1)	--	0.11	0.11
Alternate (D_2)	--	0.06	0.06
Polecat Bench			
Proposed Route (F_1)	--	0.01	0.01
Alternate (F_2)	--	0.01	0.01

Source: ESE, 1996.

Table 4-11. Selected Wildlife Resources Affected by Each Beartooth Pipeline Route Segment

Common Name	Scientific Name	Route Segment	Distance (ft)	Route Mile
Big Game Winter Range (length through)				
Mule Deer	*Odocoileus hemionus*	D1	9,500	
		Bluewater	6,500	
Pronghorn Antelope	*Antilocapra americana*	F1	38,000	
		F2	33,000	
Grouse Leks (distance from)				
*	*	F1	1,500	
		F1	1,500	
		F1	1,500	
		F1	2,000	
		F2	0	
		F2	100	

* Species not differentiated

Construction activities will not occur during breeding season (March through April), therefore, lek buffer zones (2 miles) are not included.

Source: ESE, 1996.

Table 4-12. Potential Known State and Federal Listed Species with Each Beartooth Pipeline Route Segment

	Common Name	Scientific Name	Route Segment	Distance from Route (ft)	Federal Status	State Rank
Fauna	Peregrine Falcon	*Falco peregrinus*	A1	2,000	E	S1S2B
	Black-tailed Prairie Dog	*Cynomys ludovicianus*	D1	1,500		S2
			D2	0 (length through=0.4 mi)		
			F1	1,000		
			F1	1,500		
			F2	0 (length through=0.7 mi)		
	Milk Snake	*Lampropeltis triangulum*	A0	1,000		S1
			D1	7,000		
			Bluewater	3,500		
Flora	Gray's Milkvetch	*Astragalus grayi*	E	0		S1
	Geyer Milkvetch	*Astragalus geyeri*	F2	2,500		S2
	Parrot-head Indian Paintbrush*	*Castilleja pilsoa var. longispica*	D1	1,000, 6,500		S1
			Bluewater	3,500, 3,500		
	Giant Helleborine	*Epipactis gigantea*	D1	2,000		S2
			Bluewater	4,500		
	Rabbit Buckwheat*	*Eriogonum lagopus*	D1	2,000, 7,500	C2	S3
			Bluewater	4,500, 3,500		
	Joe-pye Weed	*Eupatorium maculatum*	D1	7,000		S1
			Bluewater	3,500		
	Beaked Spikerush	*Eleocharis rostellata*	D1	7,000		S2
			Bluewater	3,500		
	Swamp Milkweed	*Asclepias incarnata*	D1	7,000		S1
			Bluewater	3,500		

* Species occur in two habitat locations.

E = endangered

C1 = candidate species

C2 = candidate species

S1 = critically imperiled because of extreme rarity

S2 = imperiled because of rarity

Source: NRIS, 1996.

Table 4-13. Cultural Resources Associated with the Proposed Route and Each Route Alternate

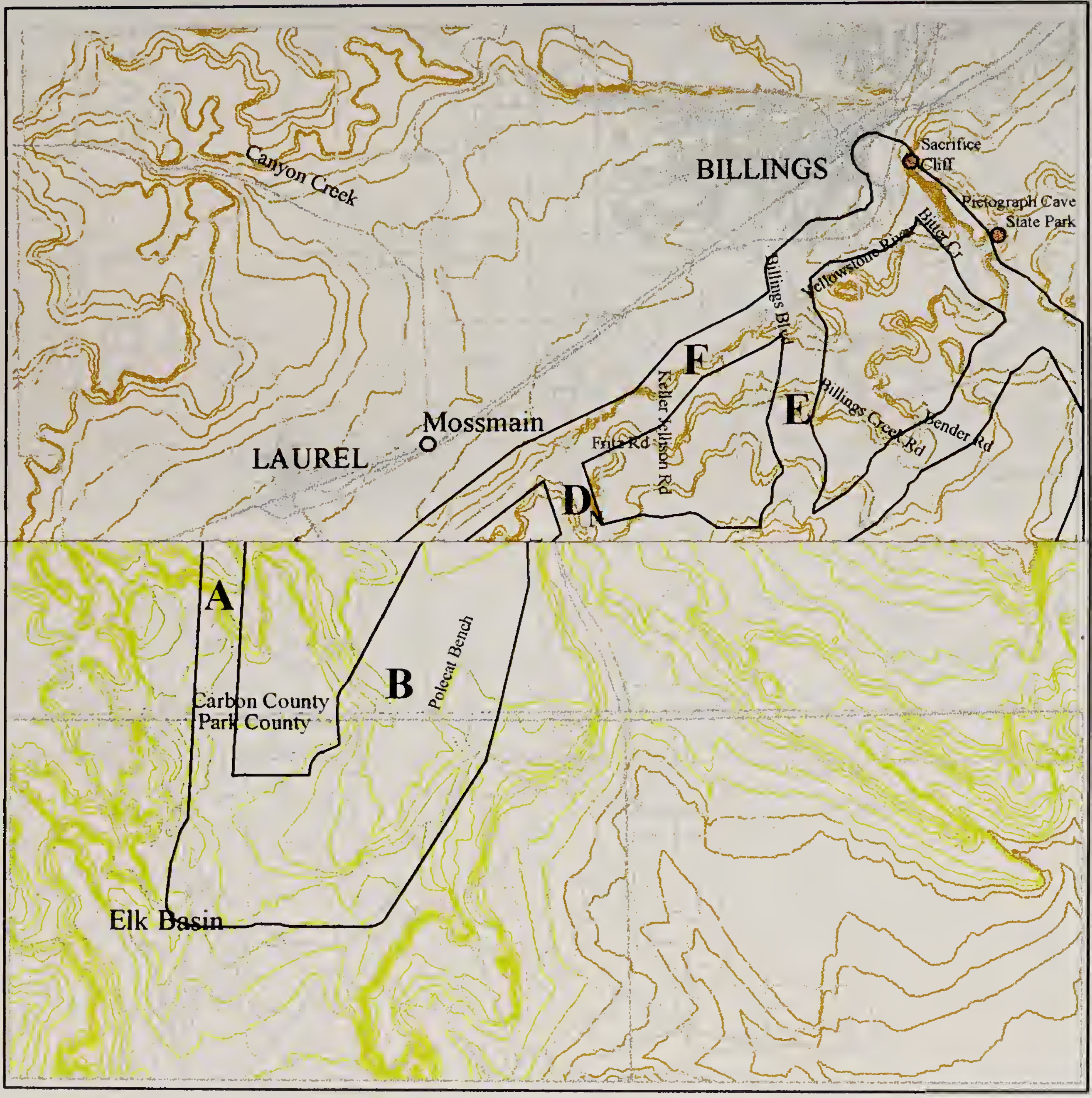
	Irrigation Ditches	Historic Road Crossings	Eligible Sites	Unknown Eligibility Sites
Proposed Route	3	27	3	6
Route Alternates				
Billings Boulevard				
Proposed Route (A_1)	2	6	--	2
Alternate (A_2)	2	6	--	1
Blue Creek				
Proposed Route (B_1)	--	5	--	--
Alternate (B_2)	--	13	--	1
Bluewater Creek				
Proposed Route	--	--	--	--
Alternate	--	--	--	--
Express				
Proposed Route (D_1)	1	21	--	--
Alternate (D_2)	--	6	2	--
Polecat Bench				
Proposed Route (F_1)	--	--	2	3
Alternate (F_2)	--	--	1	12

Source: Ethnoscience, 1996.

Figures

Environmental
Science &
Engineering, Inc.

A CILCORP Company



Legend

— Preliminary Project Corridors

🟩 National Forests

Figure 2-1 Preliminary Project Corridors

Prepared for:

MONTANA DEPARTMENT OF
ENVIRONMENTAL QUALITY

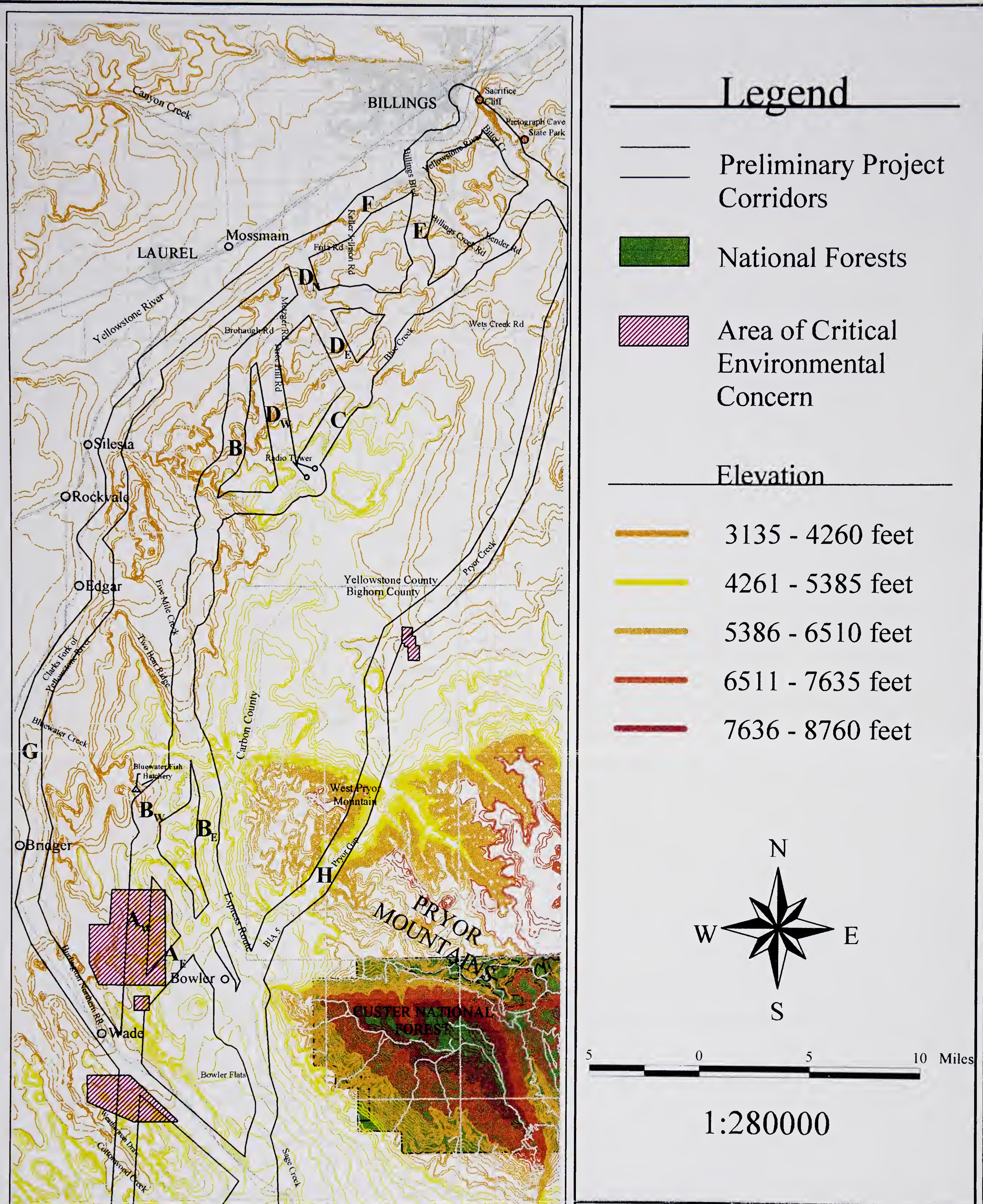


Figure 2-1
Preliminary Project Corridors

Prepared for:

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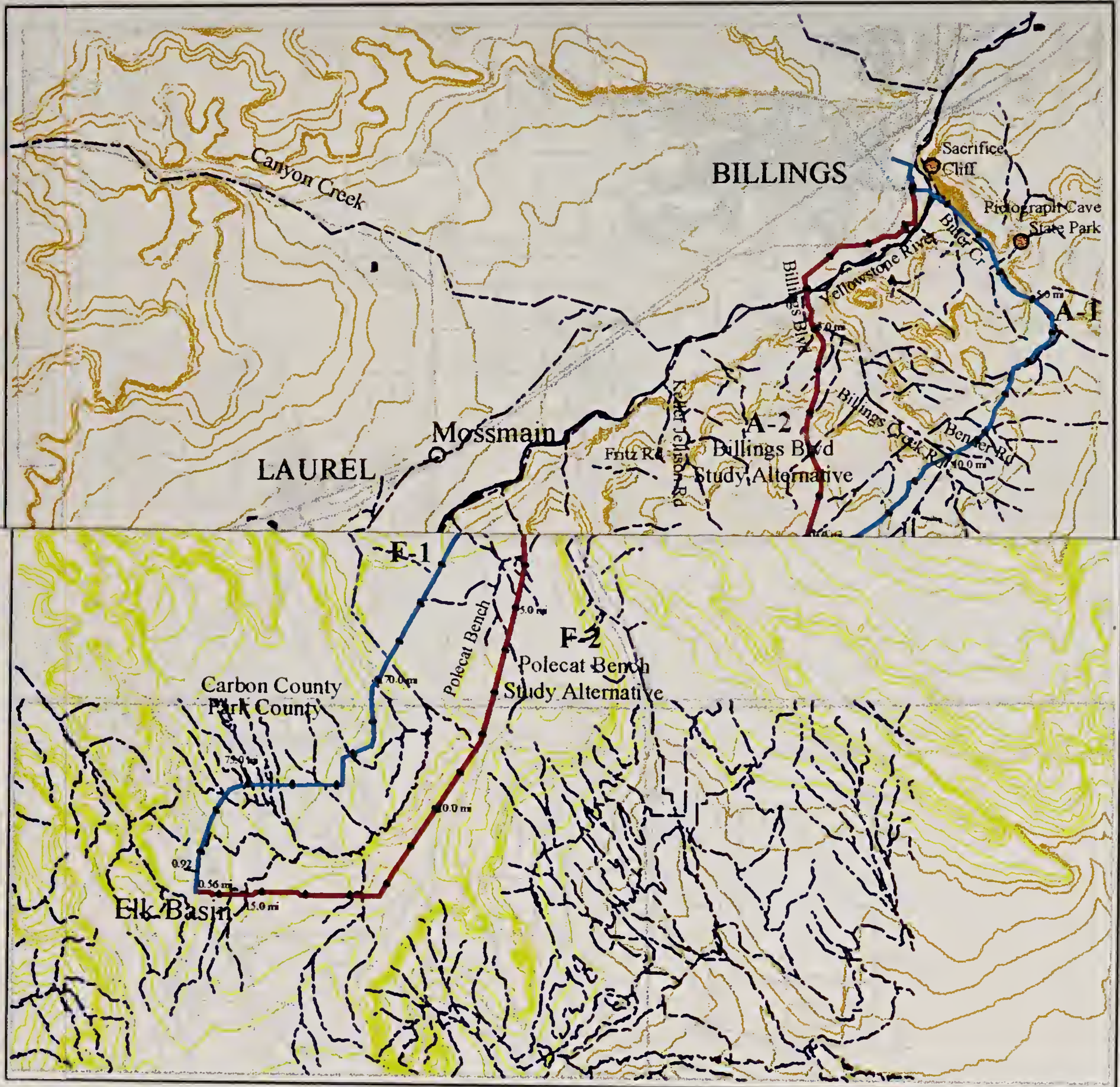

Legend

🟥 Route Alternatives

🟦 Proposed Route

🟩 National Forests

Figure 2-2
Route Alternatives

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

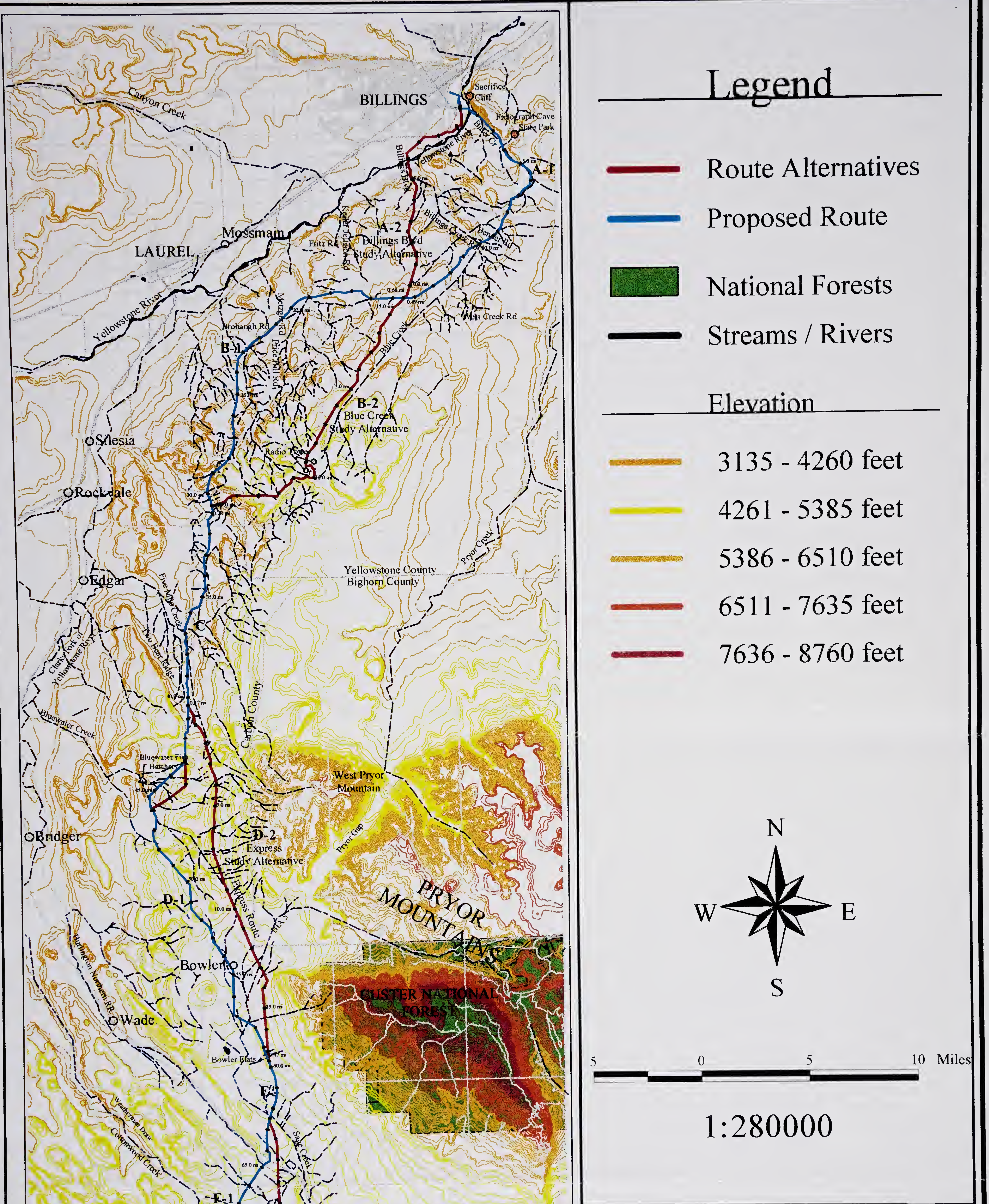

Figure 2-2
Route Alternatives

Prepared for:

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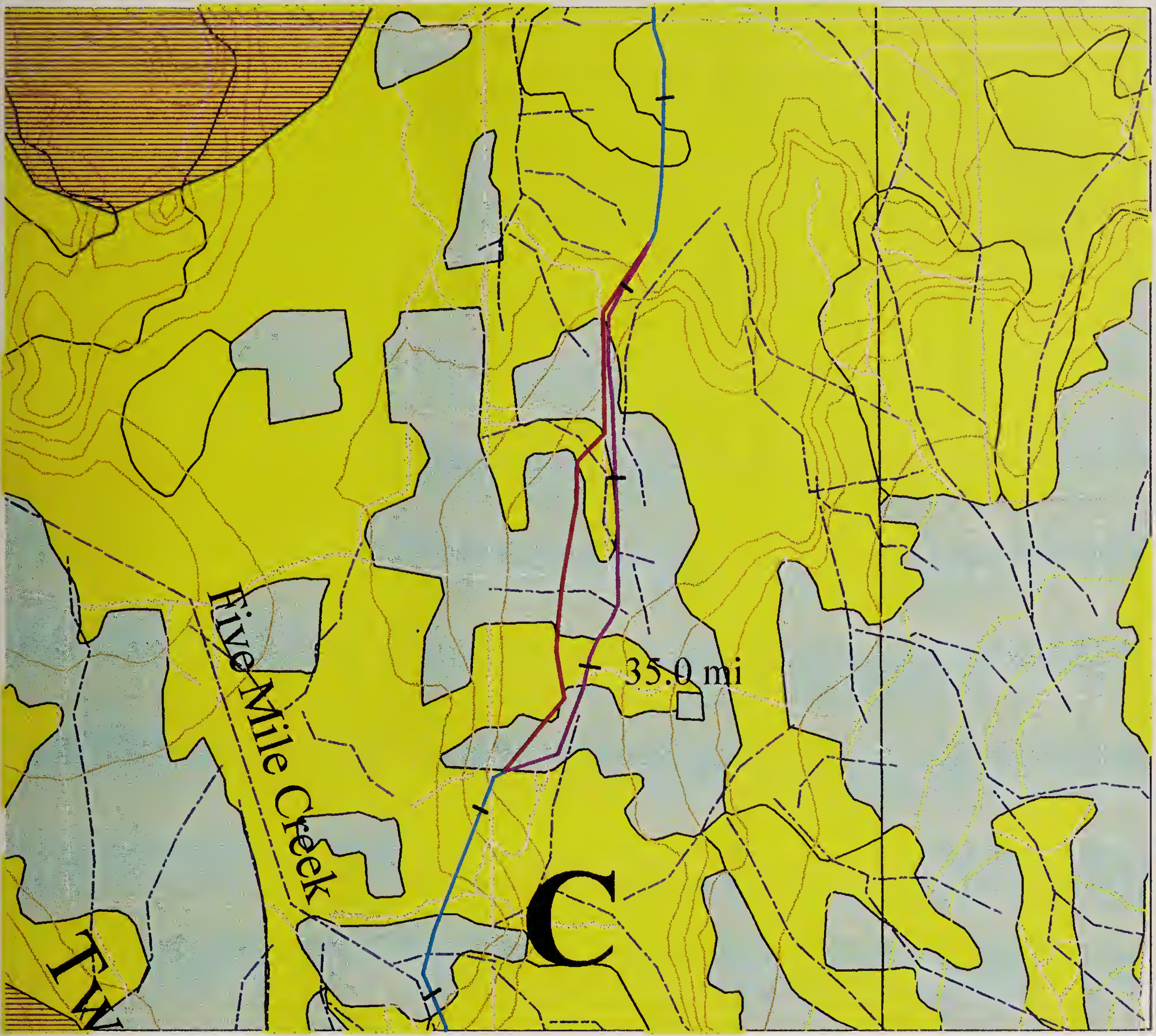

Figure 2-3
Five Mile Creek Modification

Prepared for:

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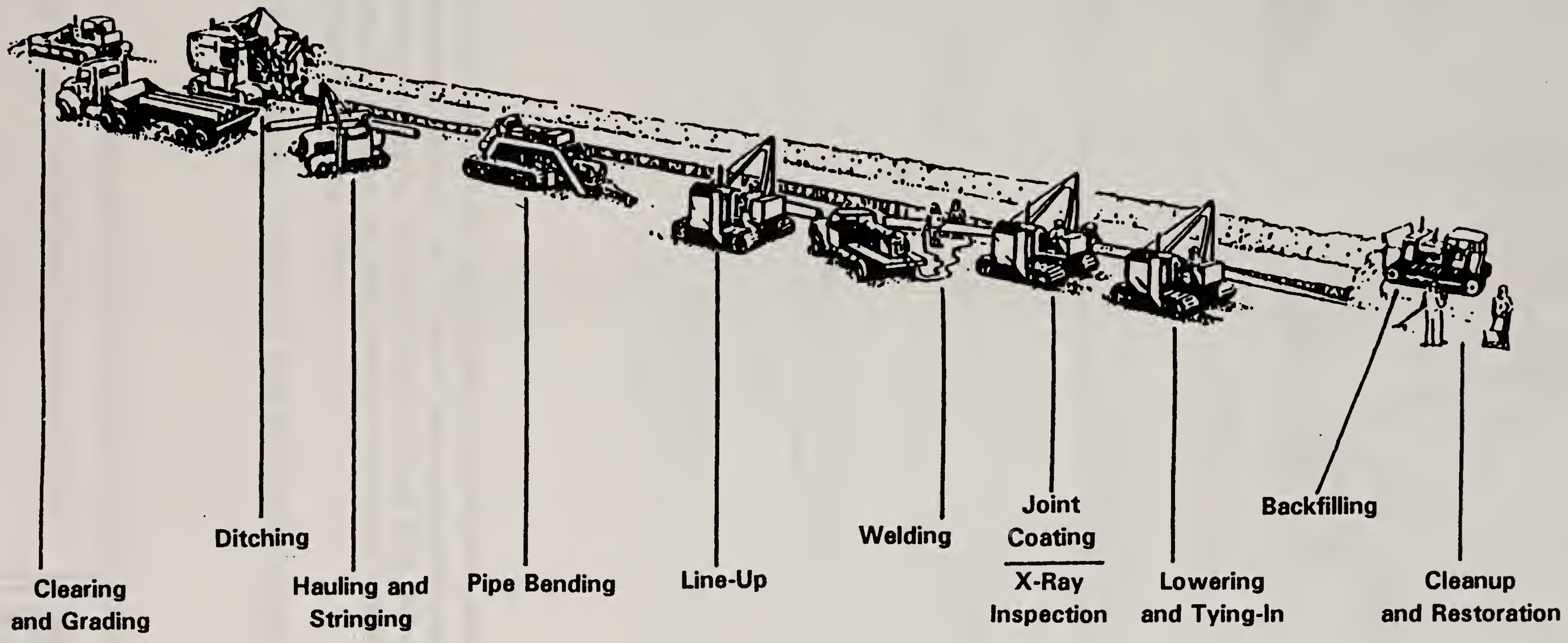
419965113LF-CONCO-PIPE



SOURCE: ACOMO PIPELINE COMPANY

Figure 2-4
TYPICAL CONSTRUCTION SPREAD

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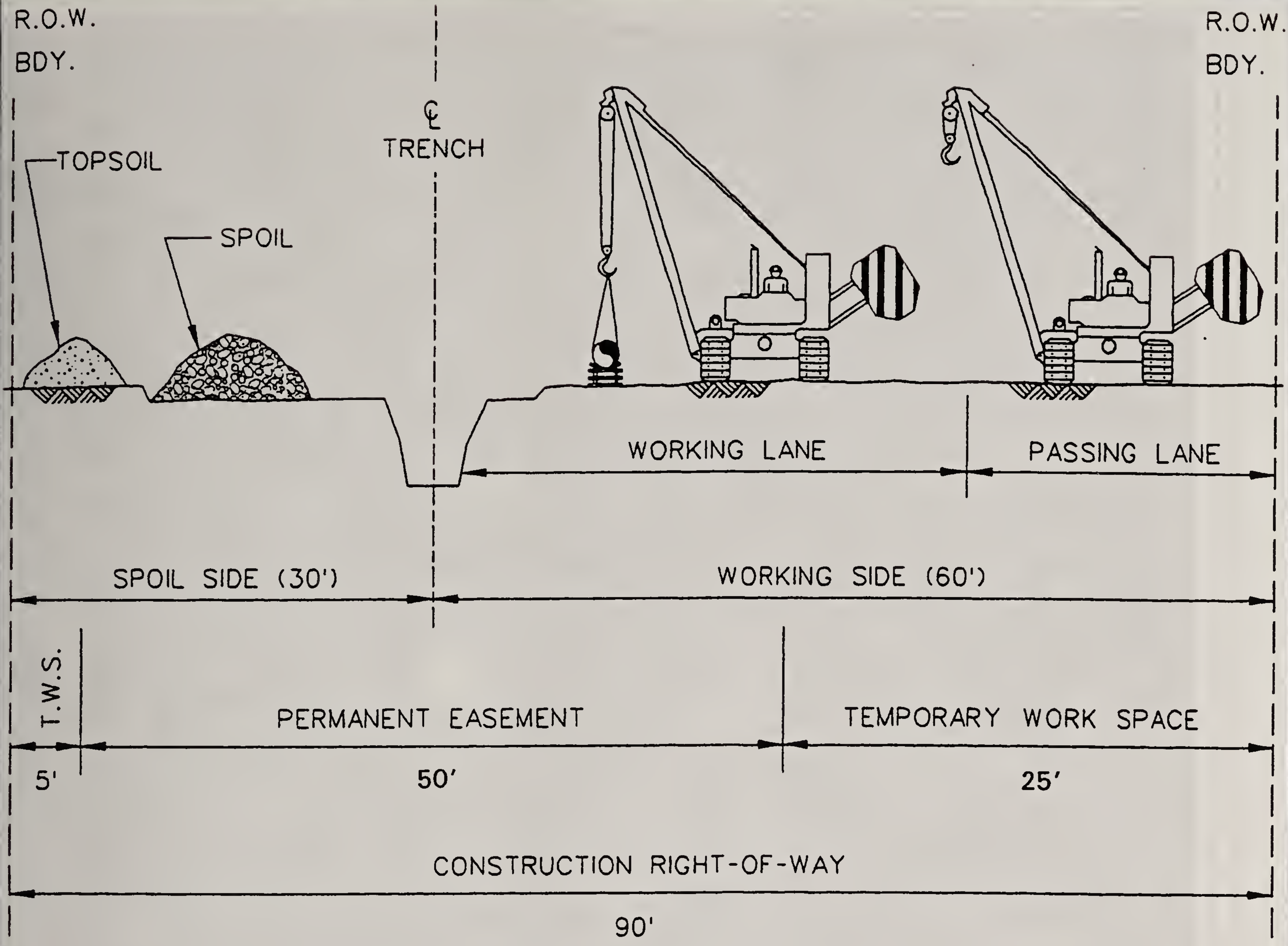

PROFILE

N.T.S.

NOTES:

1. Construction right-of-way will typically be 80 feet wide consisting of 50 feet of permanent easement and 30 feet of temporary work space. Additional temporary work space will be necessary at major road, rail and river crossings and at other strategic locations, as required. Certain situations may require a narrower width.

2. This drawing reflects "Trench and Spoil Side" topsoil stripping procedure.

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Figure 2-5
ILLUSTRATION OF TYPICAL PIPELINE CONSTRUCTION RIGHT-OF-WAY
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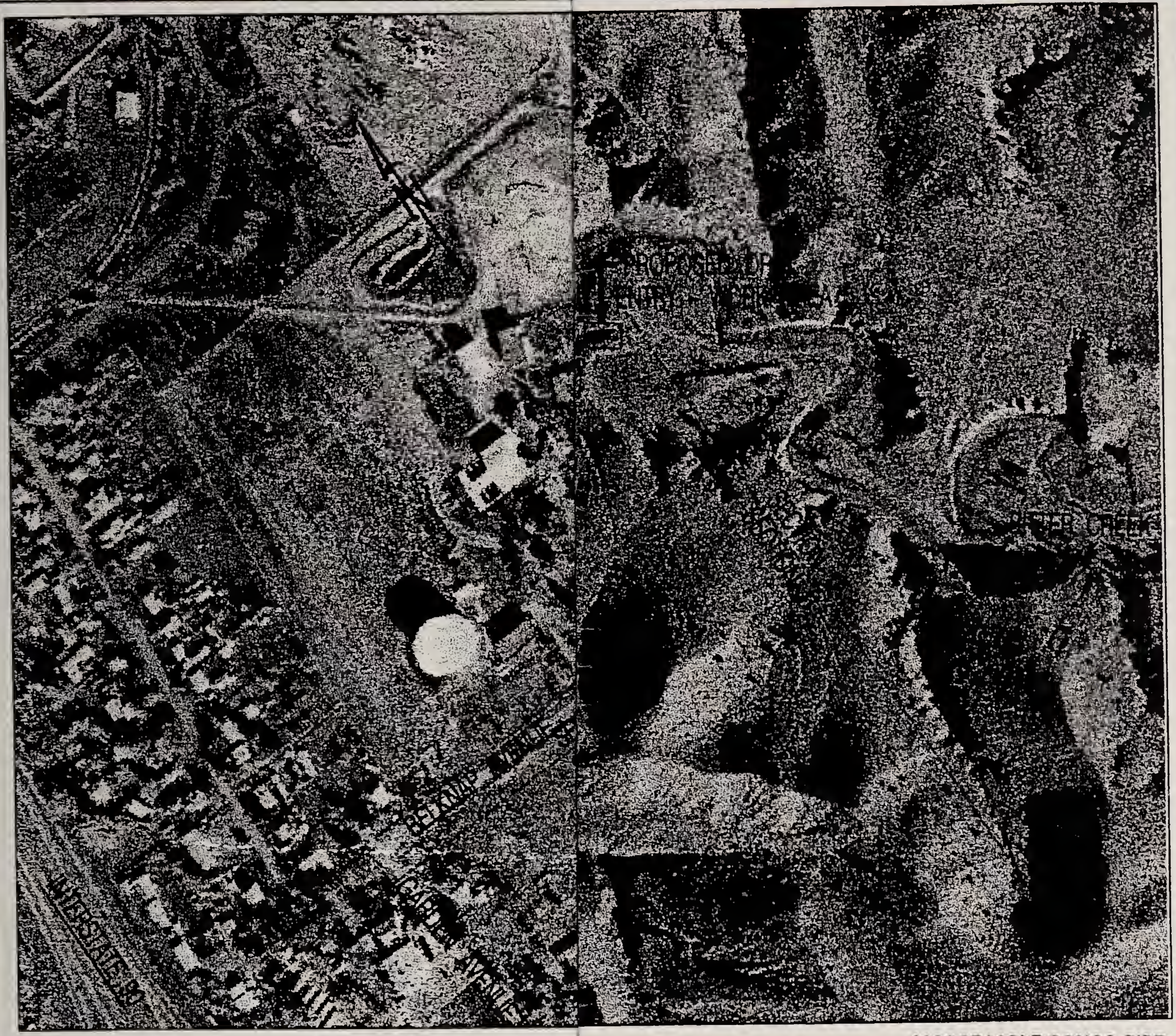

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NOTE:
FOR A DETAILED DESCRIPTION OF THE COMPOSITIC
OF THE BORE HOLES, SEE THE AMOCO-CONOCO PIP
YELLOWSTONE RIVER CROSSING GEOTECHNICAL REP
PREPARED BY MAXIM TECHNOLOGIES.

LEGEND

⊠ PROPOSED BORING LOCATIONS (75' MIN. OFFSET FROM PROPOSED DIRECTIONAL DRILL LINE)

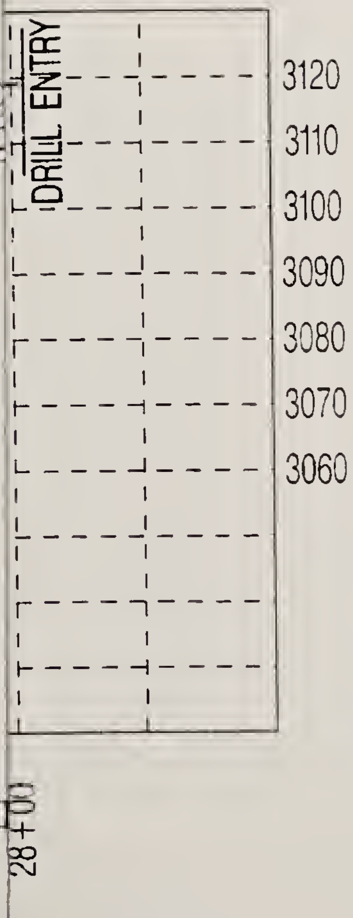
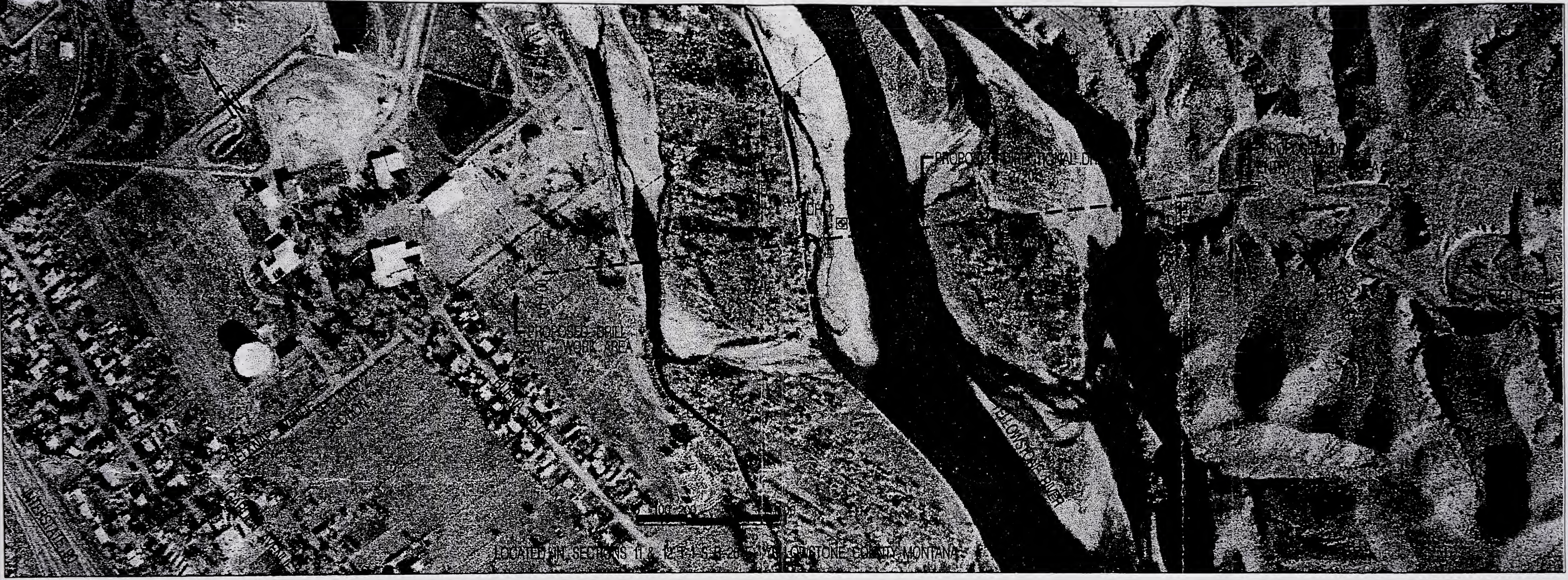


Figure 2-6
INTERCONNECT PIPELINE
PROPOSED YELLOWSTONE RIVER CROSSI
VIA DIRECTIONAL DRILLING
Prepared for:
MONTANA DEPARTMENT OF ENVIRONME EERING, INC.

ESE
A CILCORP Company


PROPOSED DIRECTIONAL DRILL
DH-1
DH-2
PROPOSED DRILL EXIT WORK AREA
YELLOWSTONE RIVER
INTERSTATE 90
100 200
LOCATED IN SECTIONS 11 & 12 T-1-S R-26-E YELLOWSTONE COUNTY, MONTANA

419965113LF-CONCO-PIPE

NOTE:
FOR A DETAILED DESCRIPTION OF THE COMPOSITION OF THE BORE HOLES, SEE THE AMOCO-CONOCO PIPELINE YELLOWSTONE RIVER CROSSING GEOTECHNICAL REPORT PREPARED BY MAXIM TECHNOLOGIES.

LEGEND

⊠ PROPOSED BORING LOCATIONS (75' MIN. OFFSET FROM PROPOSED DIRECTIONAL DRILL LINE)

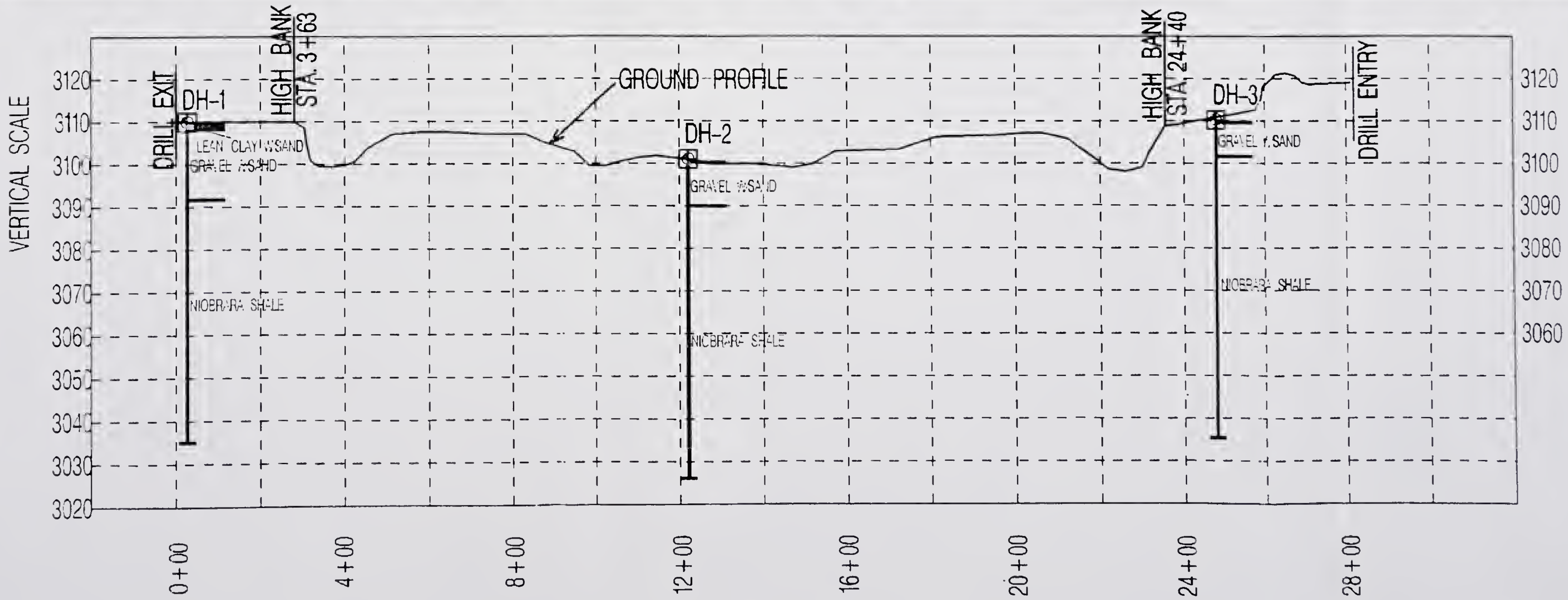
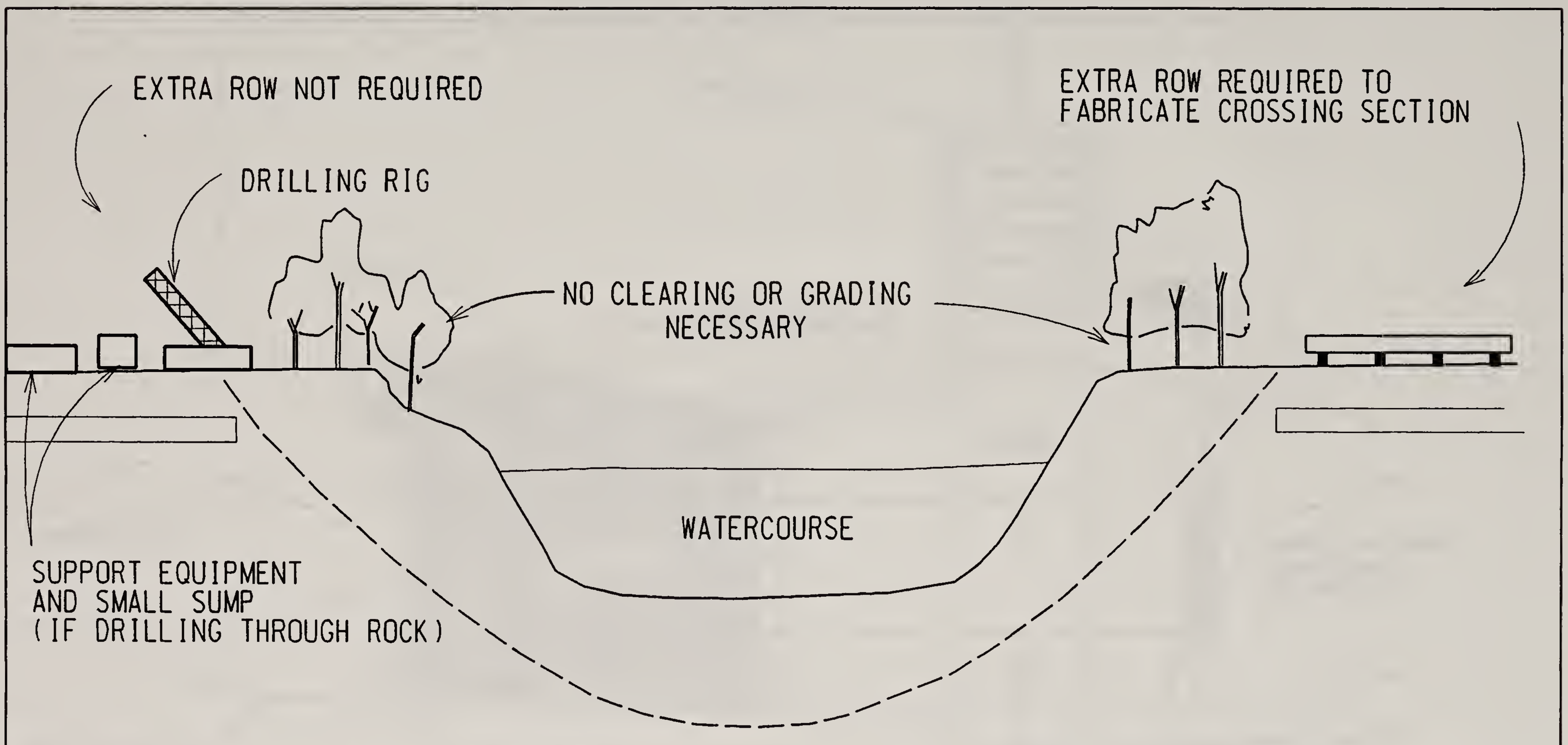


Figure 2-6
INTERCONNECT PIPELINE
PROPOSED YELLOWSTONE RIVER CROSSING
VIA DIRECTIONAL DRILLING
Prepared for:
MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

SOURCE: ROONEY ENGINEERING, INC.

ESE
A CILCORP Company

82960I9\EXBHIT\FIG2-7.DGN


EXTRA ROW NOT REQUIRED
DRILLING RIG
NO CLEARING OR GRADING NECESSARY
EXTRA ROW REQUIRED TO FABRICATE CROSSING SECTION
WATERCOURSE
SUPPORT EQUIPMENT AND SMALL SUMP (IF DRILLING THROUGH ROCK)

WATER COURSE CHANNEL AND BANK VICINITY PROFILE

Figure 2-7
SCHEMATIC DRAWING OF THE DIRECTIONAL DRILLING METHOD OF STREAM AND RIVER CROSSINGS

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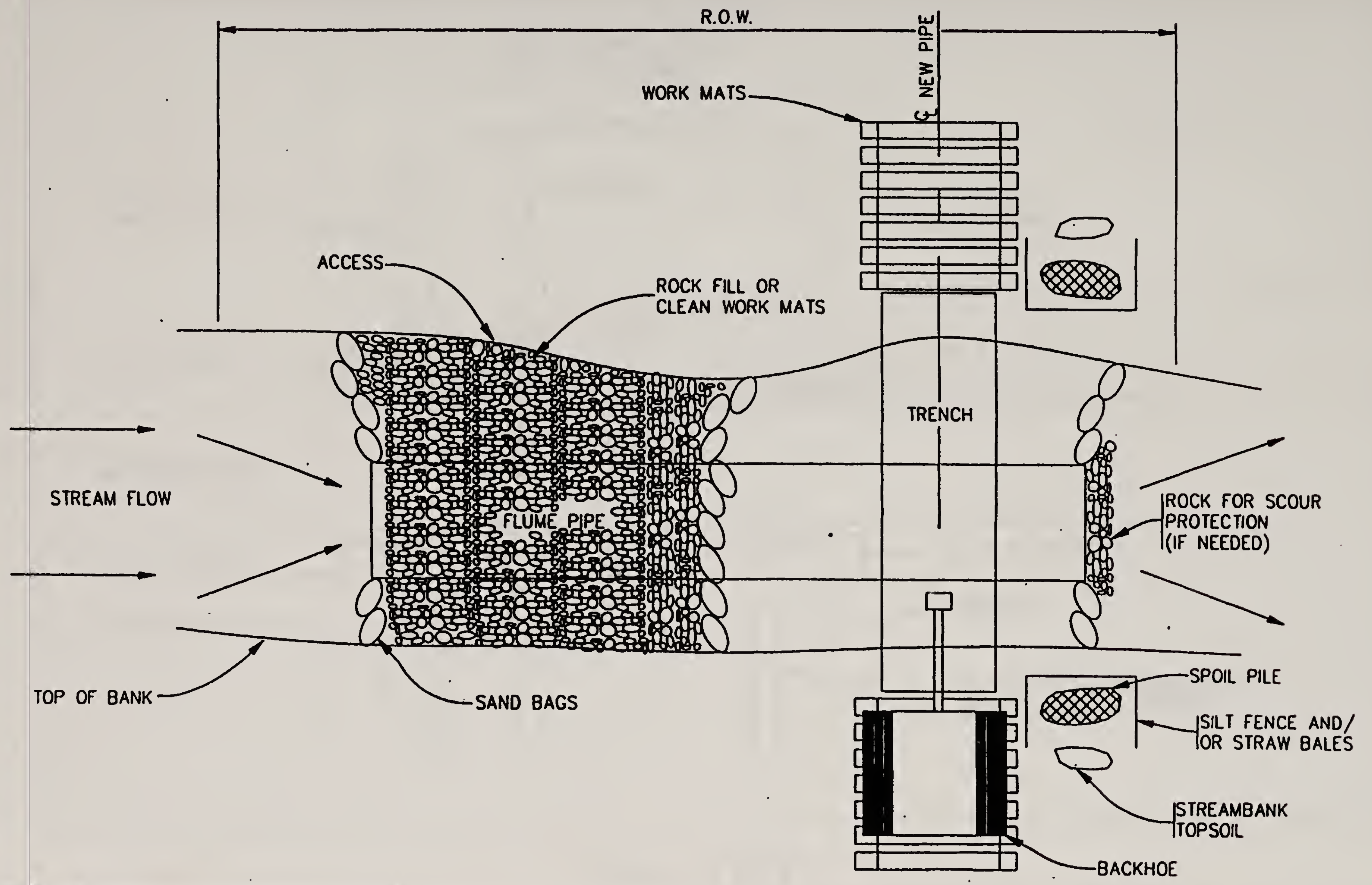

SOURCE: ROONEY ENGINEERING, INC.

Figure 2-8
FLOWING STREAM-CROSSING CONSTRUCTION PROCEDURES
Prepared for:
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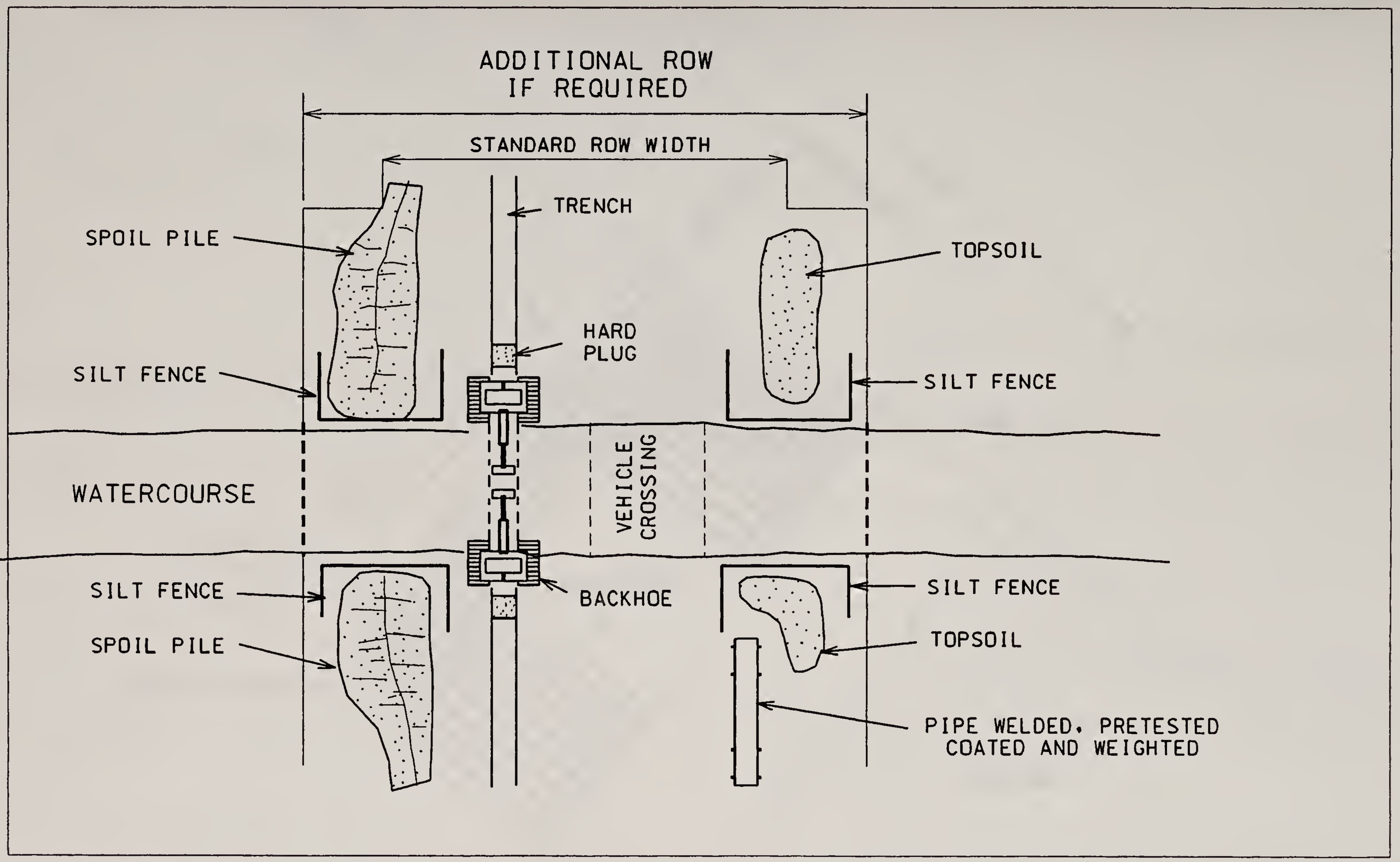
Engineering, Inc.

8296019\EXBHIT\FIG2-9.DGN



PLAN VIEW

Figure 2-9
SCHEMATIC OPEN TRENCH CROSSING METHOD FOR DRY (NON-FLOWING) STREAMS

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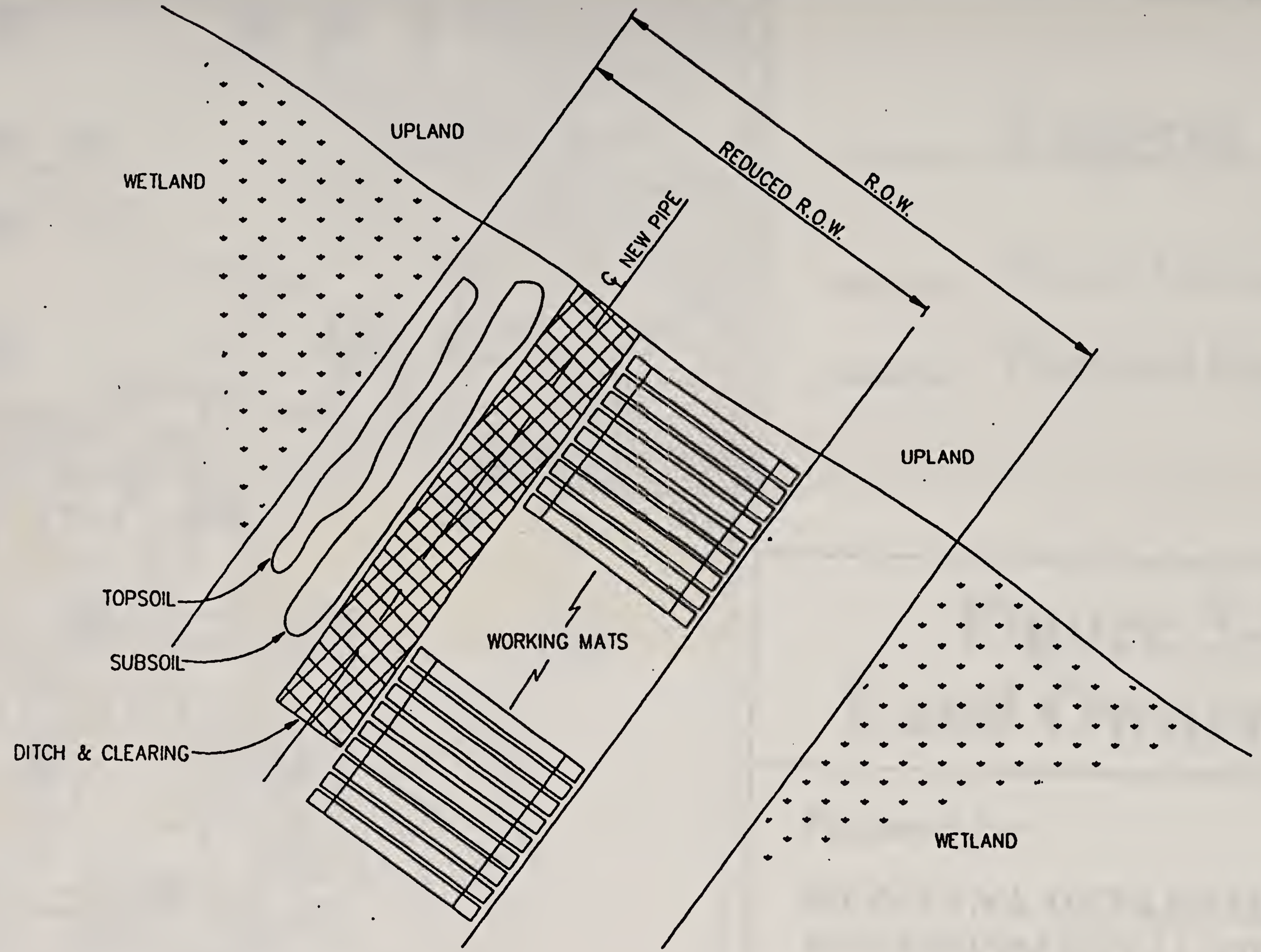

SOURCE: ROONEY ENGINEERING, INC.

Figure 2-10
STANDARD WETLAND CONSTRUCTION METHOD

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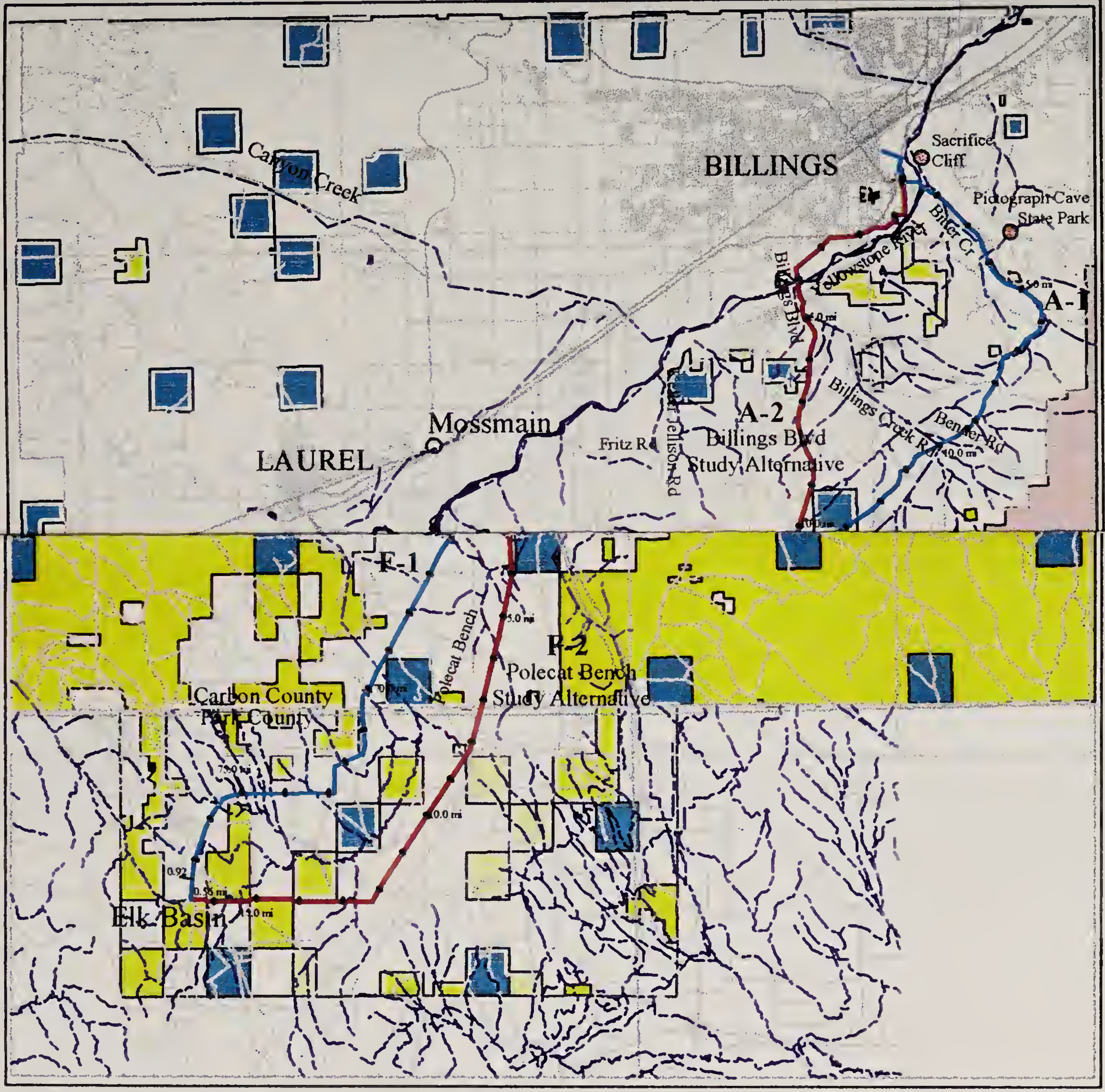

Legend

🟥 Route Alternatives

🟦 Proposed Route

Figure 3-1
Land Ownership

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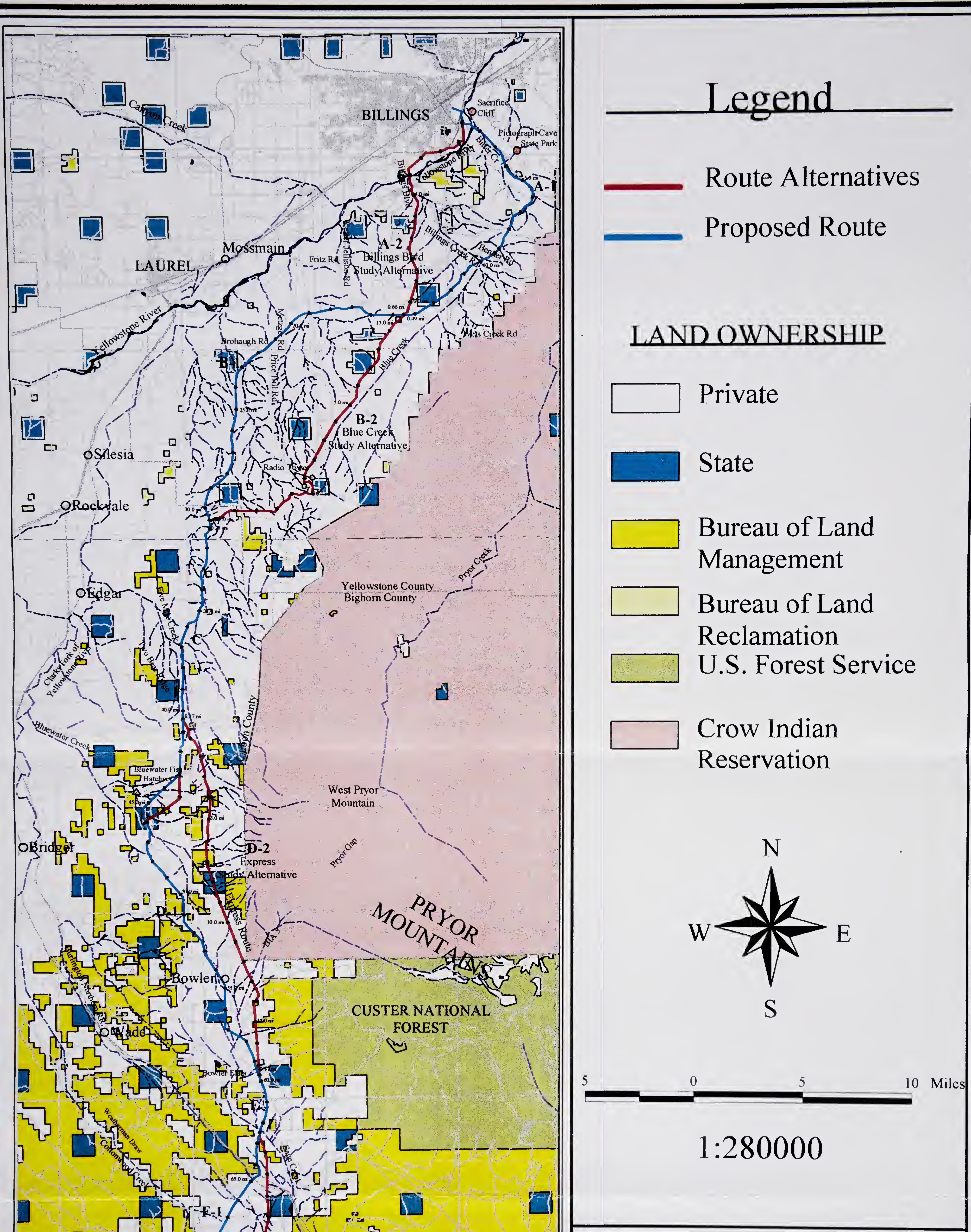

Figure 3-1
Land Ownership

Prepared for:

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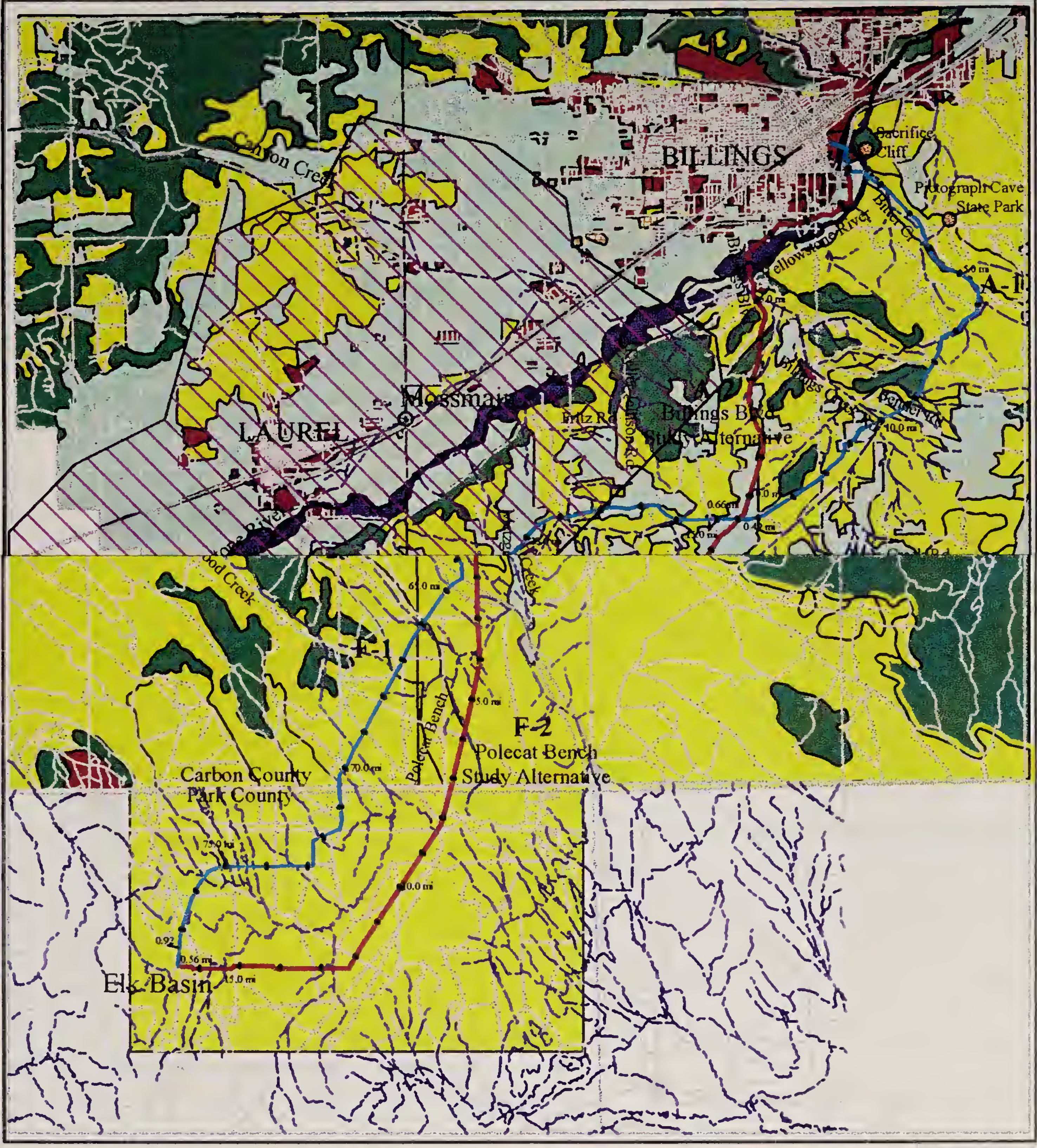
ENVIRONMENTAL QUALITY



Legend

🟥 Route Alternatives

🟦 Proposed Route

LAND USE

Figure 3-2
Land Use

Prepared for:

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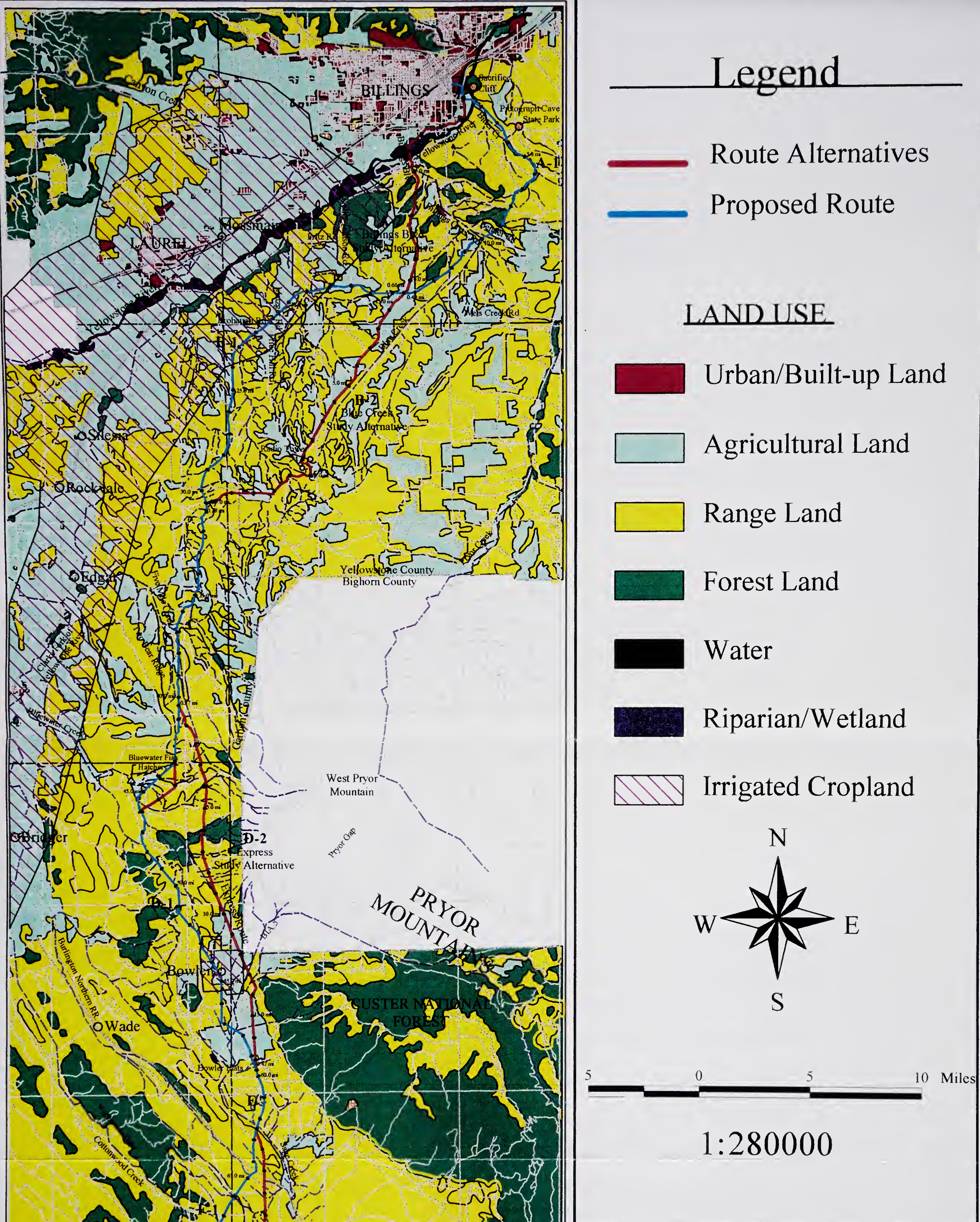

Figure 3-2
Land Use

Prepared for:

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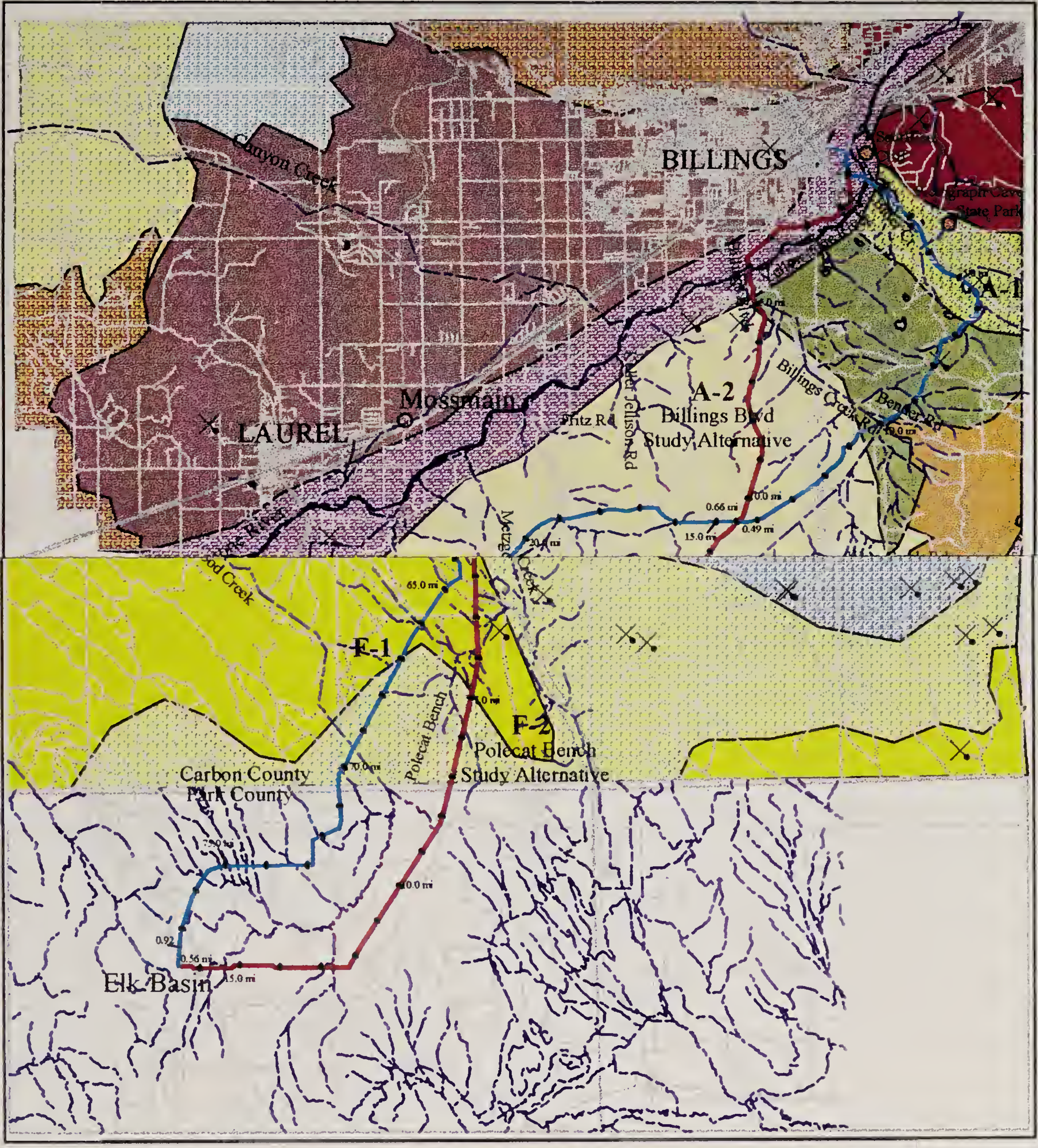

Legend

🟦 Proposed Route

🟥 Route Alternatives

⬭ Landslide Potential

✕ Mines

SOIL ASSOCIATIONS

Shale and Sandstone Uplands

▨ Wormser-Lavina-Razor

1:280000

Figure 3-3
Soils Associations/ Geologic Resources

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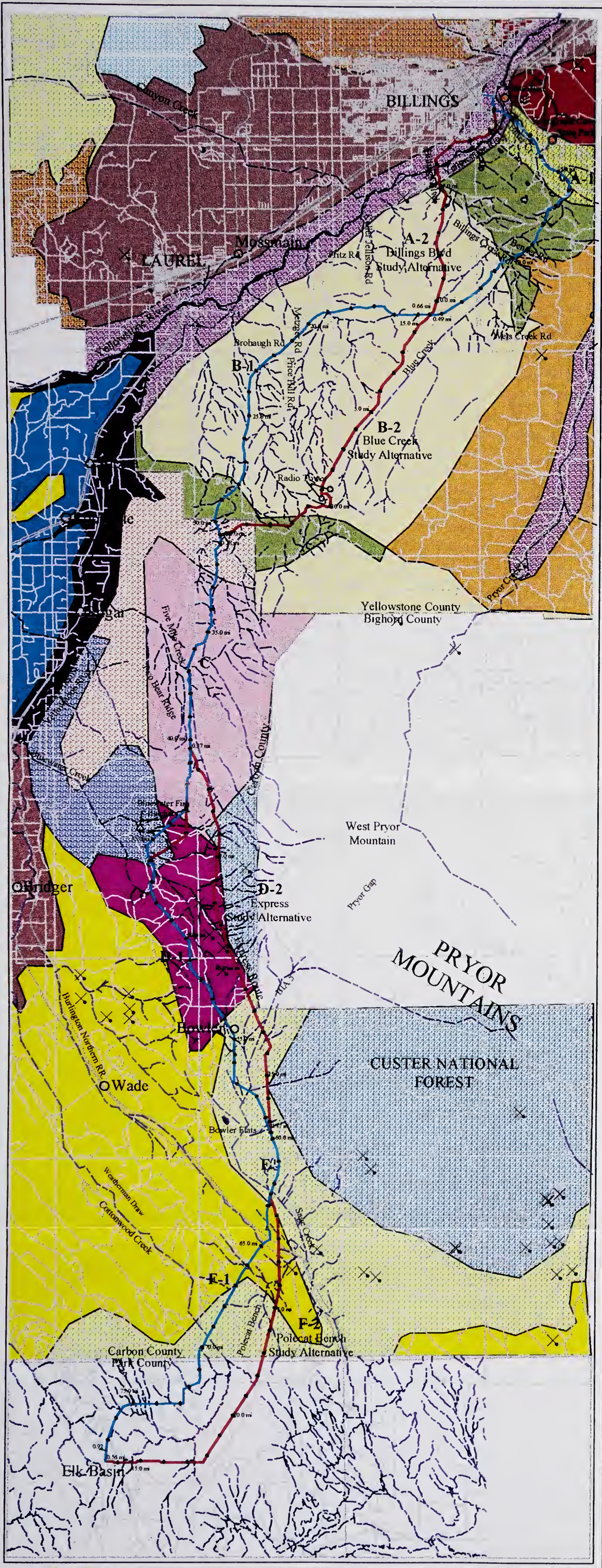

Legend

- Proposed Route
- Route Alternatives
- Landslide Potential
- ✕ Mines

SOIL ASSOCIATIONS

Shale and Sandstone Uplands
- Wormser-Lavina-Razor
- Wayden-Cabba-Rentsac
- Absarokee-Sinnigan
- Kyle
- Bainville-Travessilla-Rock Land
- Midway-Travessilla
- Pierre-Lismas-Kyle
- Maginnis-Absarokee
- Midway-Heldt
- Bainville-Elso-McRae

Intermediate Terraces and Fans
- Heldt-Fort Collins
- Harvey-Stormitt
- Nunn-Wormser

River Terraces, Low Alluvial Fans, and Flood Plains
- McRae-Lohmiller-Keiser
- Haverson
- Haverson-Glenberg

Limestone Outcrops and Well-Drained Soils of the Mountains
- Limestone Outcrop-Lap-Windham

High Terraces and Benches
- Wanetta-Keiser
- Danvers

N
W E
S

5 0 5 10 Miles

1:280000

Figure 3-3
Soils Associations/ Geologic Resources

Prepared for:

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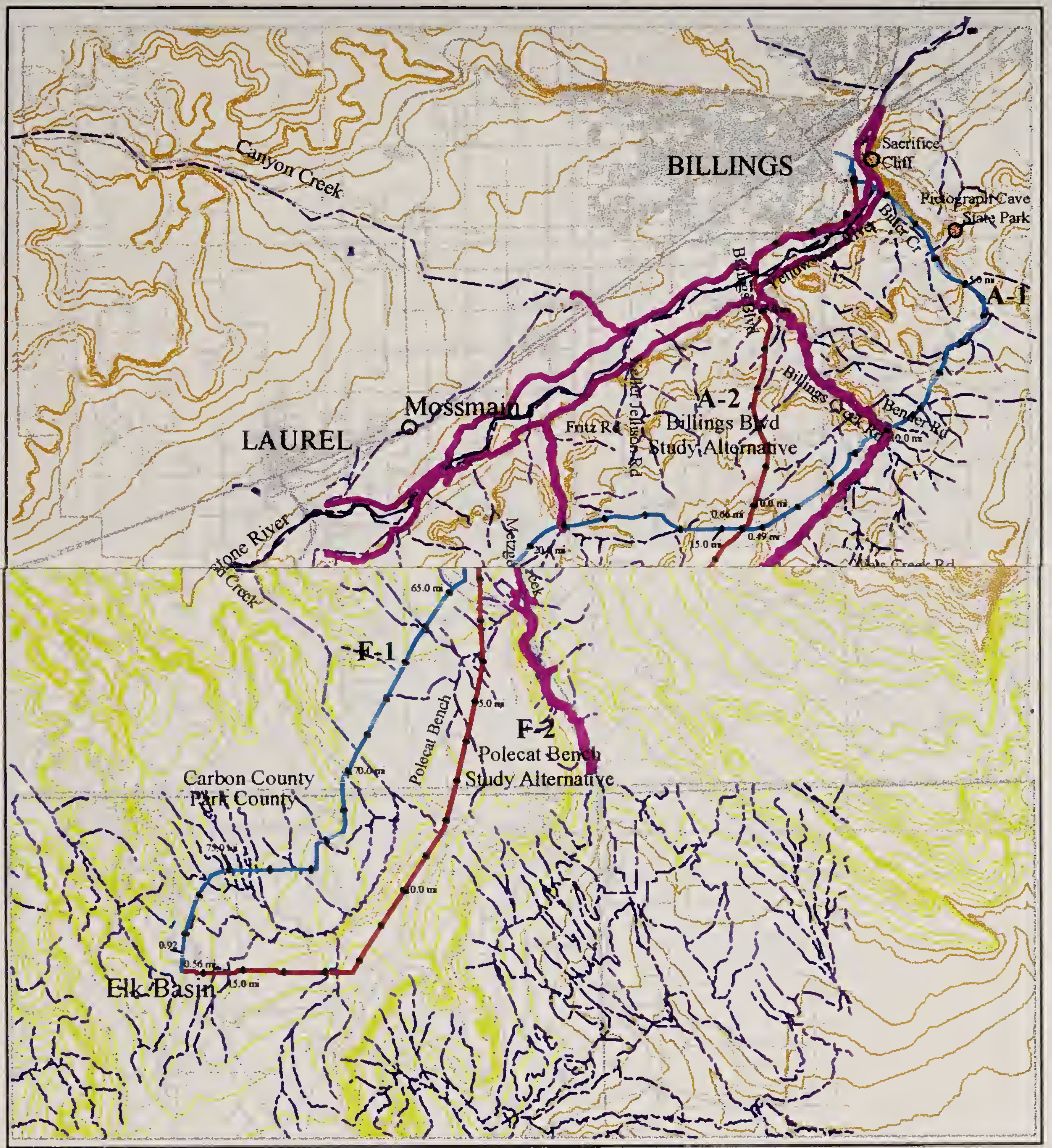

Legend

🟥 Route Alternatives

🟦 Proposed Route

⬛ Streams / Rivers

🟪 Floodplain

Figure 3-4
Surface Water Resources/Floodplains

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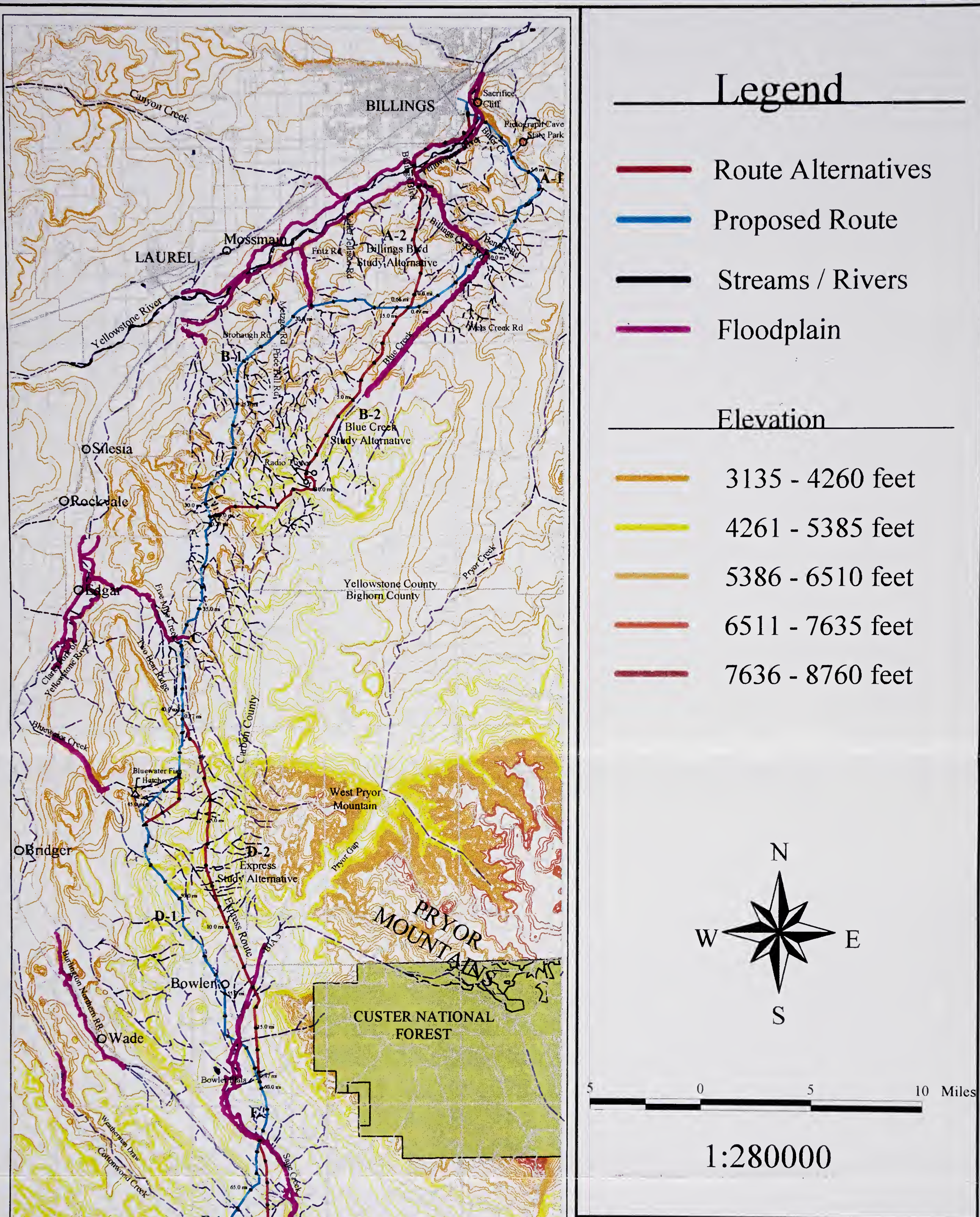

Figure 3-4
Surface Water Resources/Floodplains

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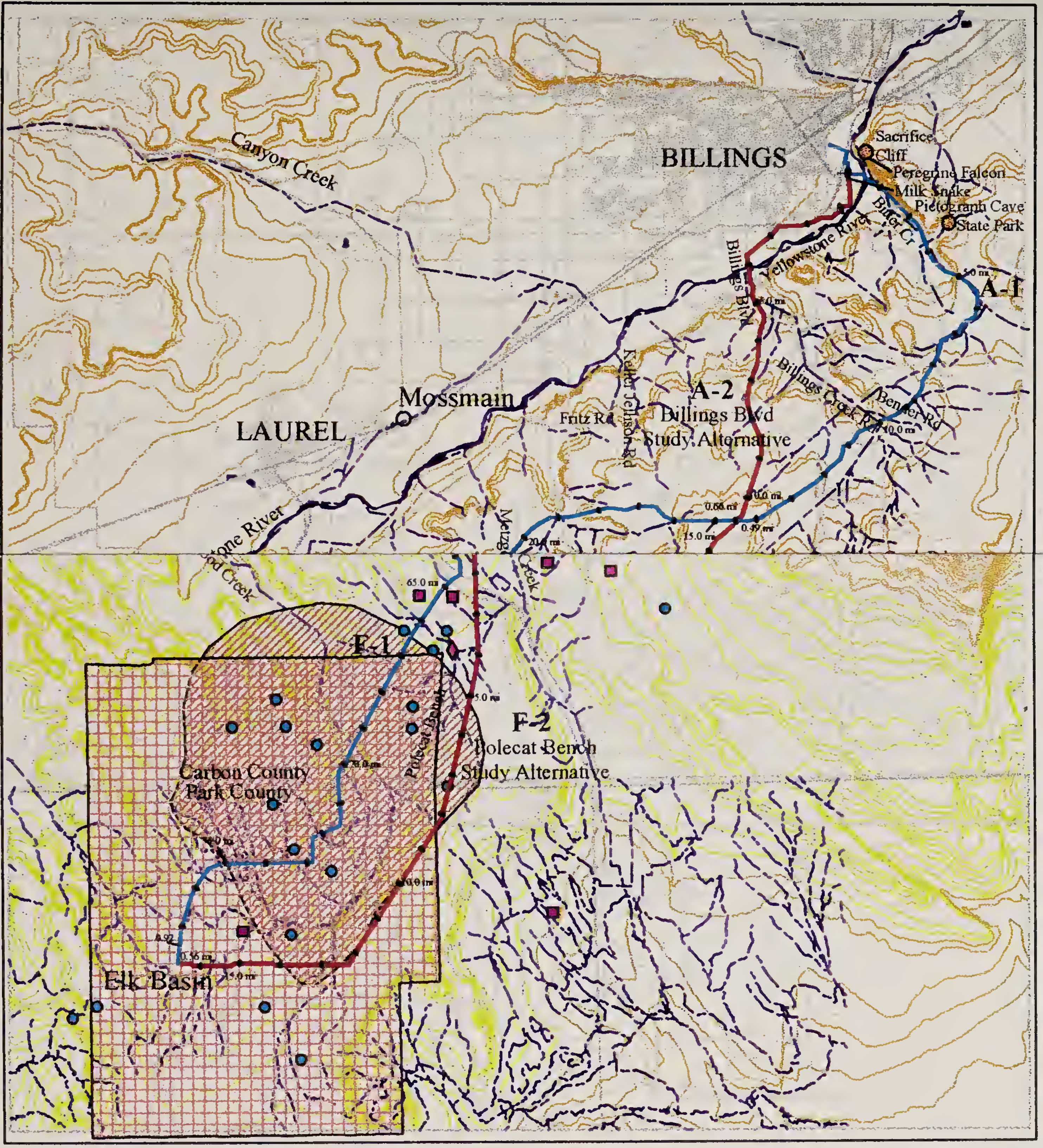

Legend

▬ Route Alternatives

▬ Proposed Route

● Sage & Sharptail Grouse Leks

Figure 3-5
Wildlife Resources

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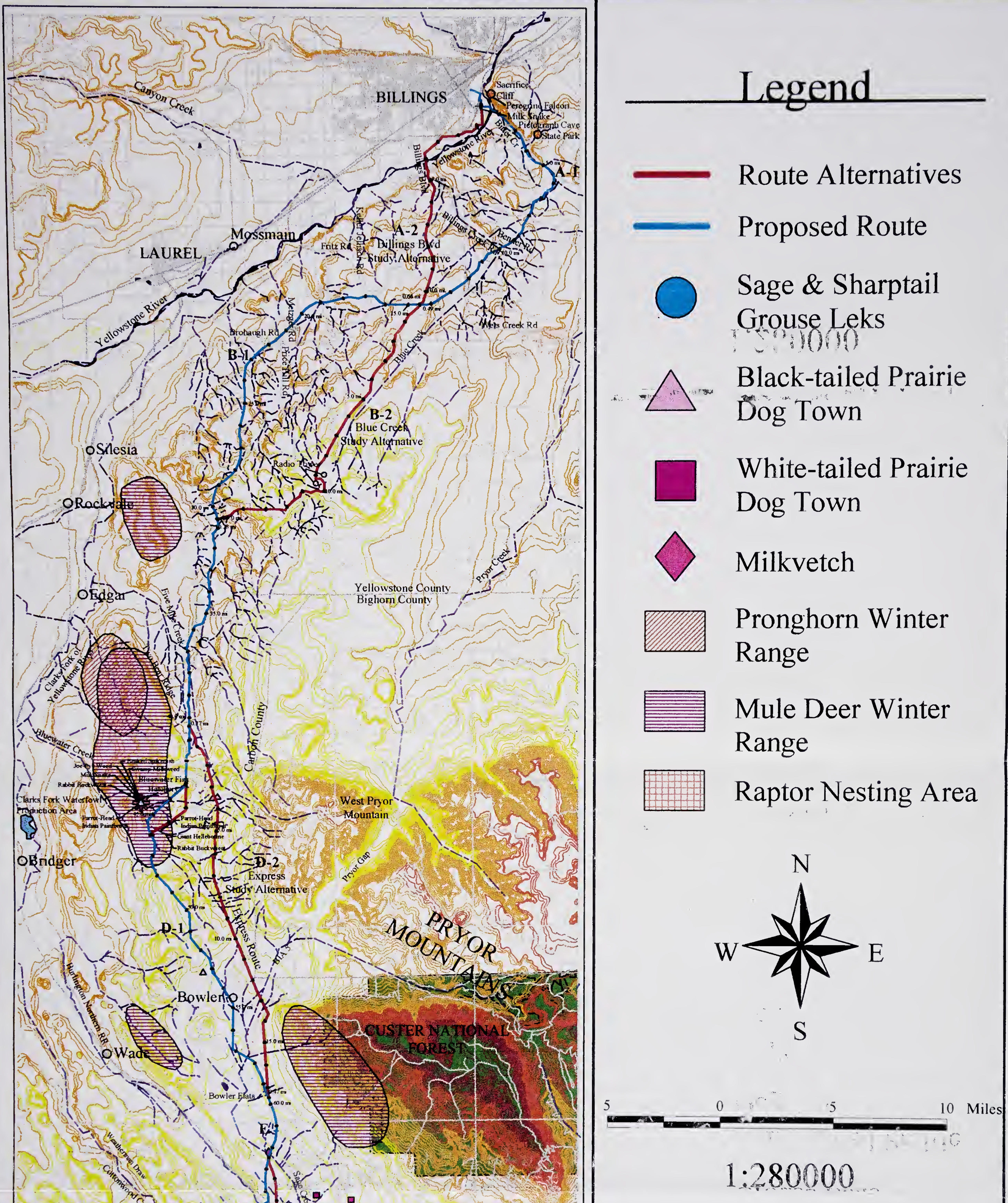

Figure 3-5
Wildlife Resources

Prepared for:

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